Working with SVR4

UNIX WORLD

McGraw-Hill's Magazine of **OPEN SYSTEMS COMPUTING**

NOVEMBER 1991

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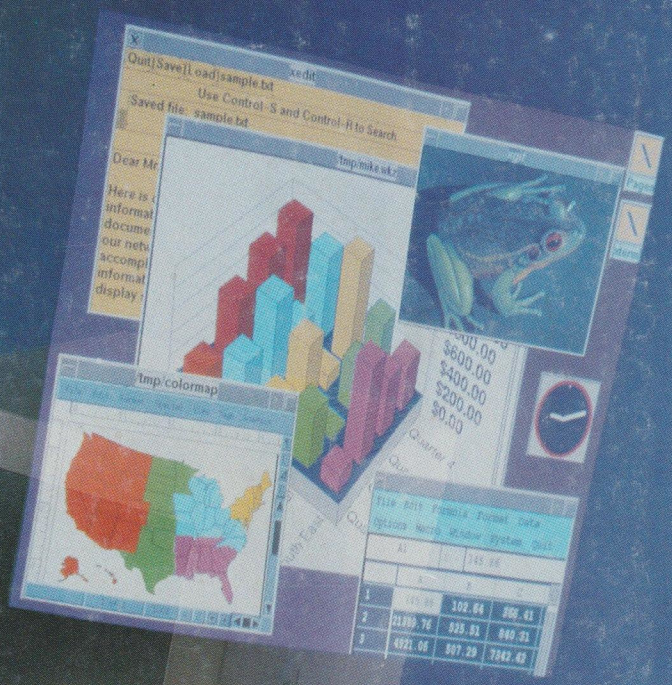

How users choose the right multiport board

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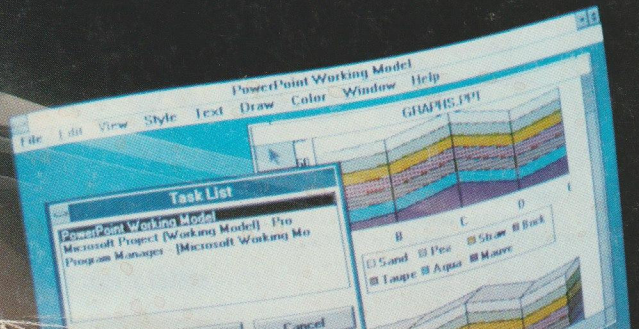
More Reviews

HP's workstations: RISC vs. CISC

3 e-mail front ends



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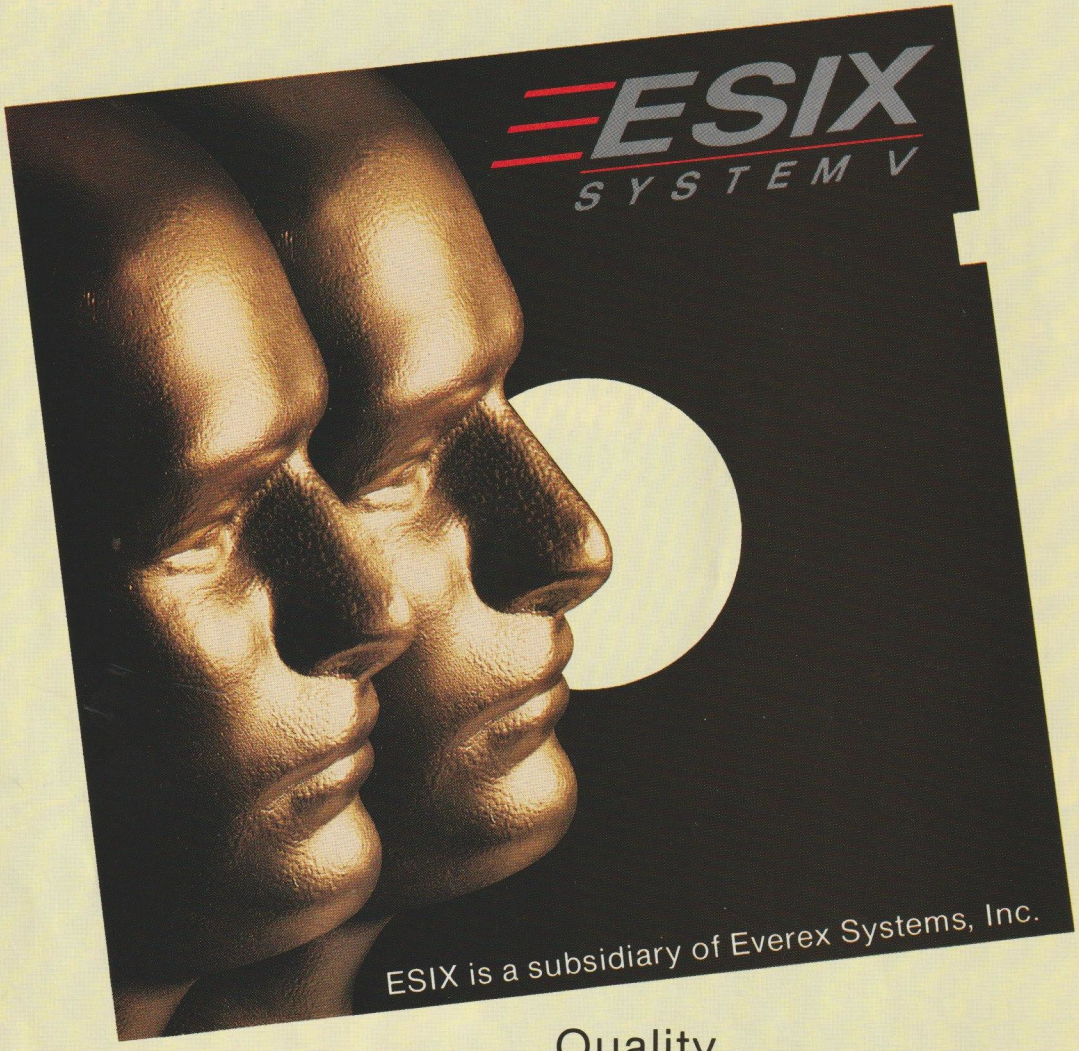

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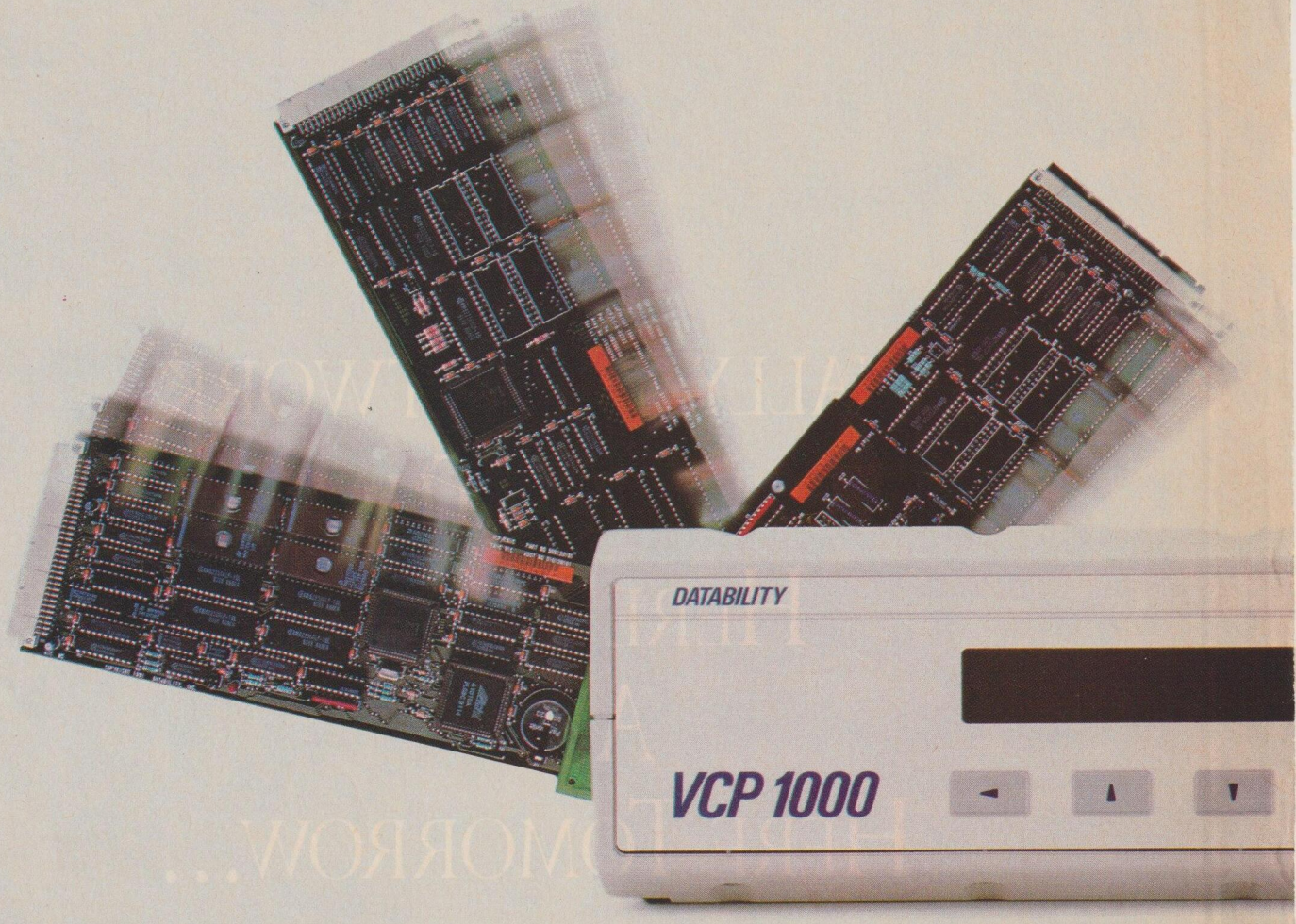

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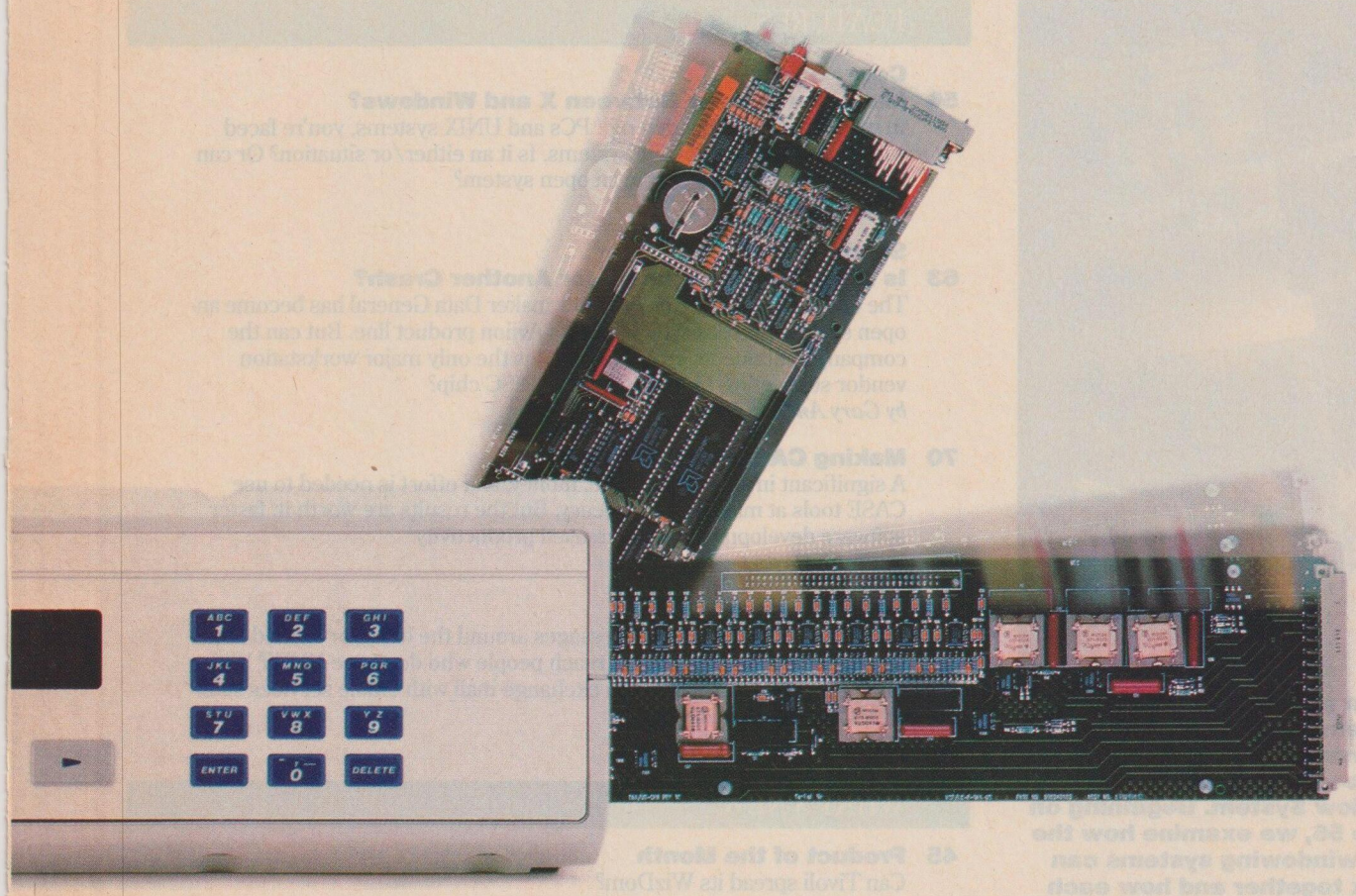

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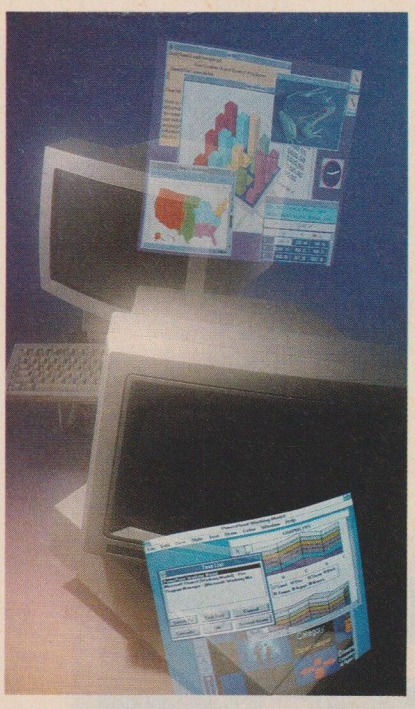

When mixing PCs with UNIX systems, users face the dilemma of whether to use Microsoft Windows or the X Window System. Beginning on page 56, we examine how the two windowing systems can work together and how each may be better suited for certain tasks. Also, for a review of three X server products for PCs, see page 99.

Cover illustration by Sandra Frank. NCD17c terminal courtesy of Network Computing Devices.

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The Audit Bureau

November 1991 • Volume VIII, Number 11 • A McGraw-Hill Publication

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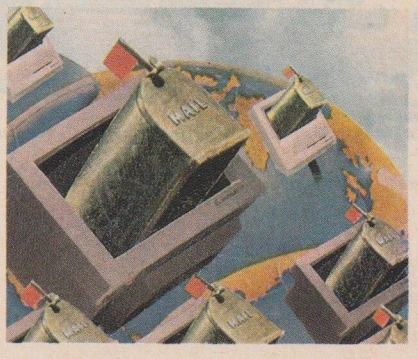
Top: *Being driven from Yugoslavia as a child has given Natural Language's Tania Amochaev the drive to succeed. See page 51.*
Middle: *Multiport boards can turn your PC into a multiuser system. See page 83 for what to look for when choosing a board.*
Bottom: *E-mail is great not only for exchanging messages with other UNIX systems, but also for connecting to non-UNIX online services. For help on making the connections, see page 77.*



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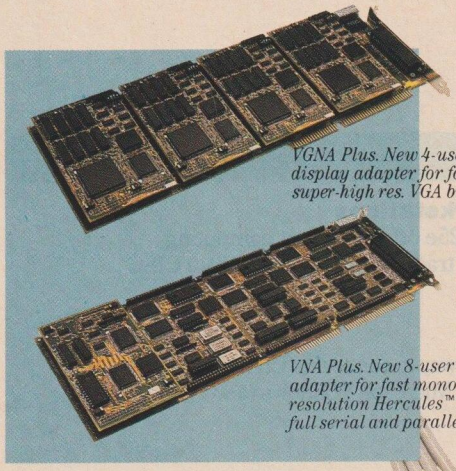

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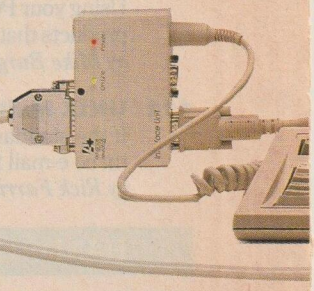

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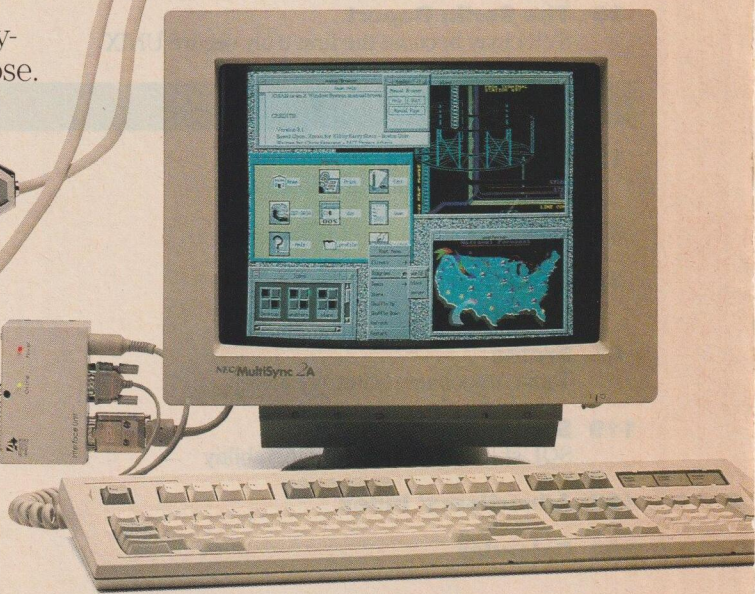

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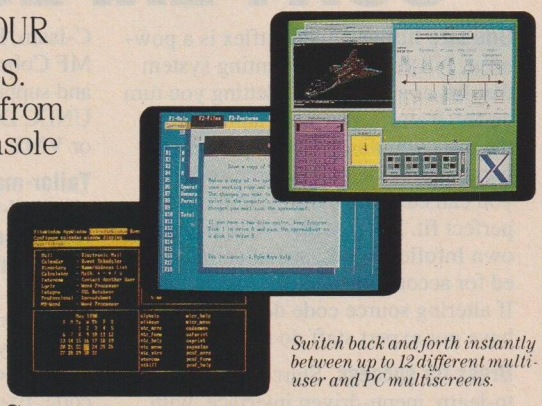

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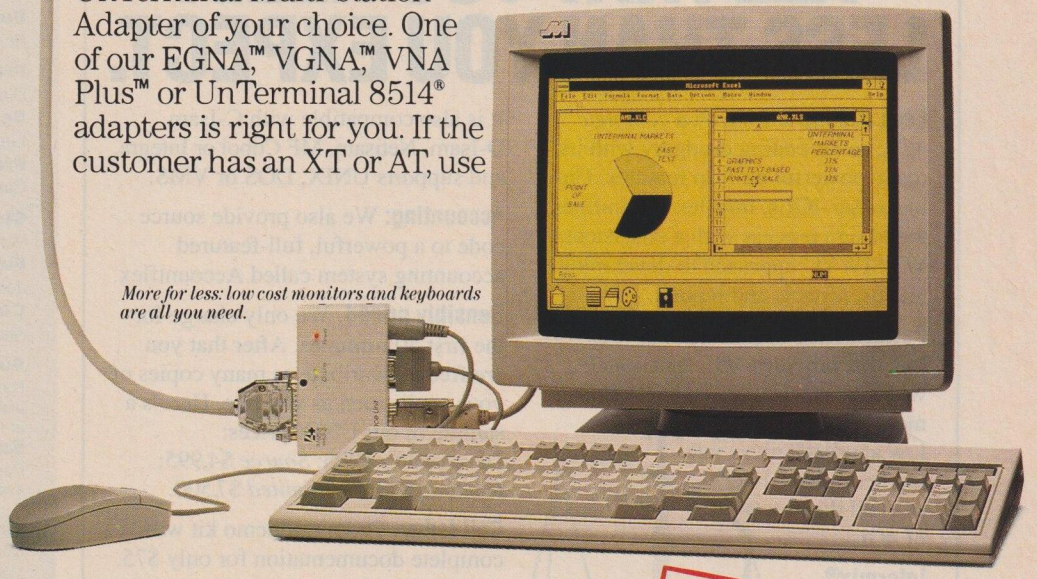

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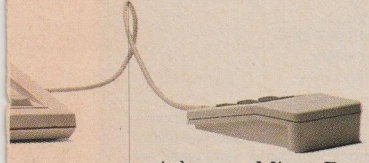

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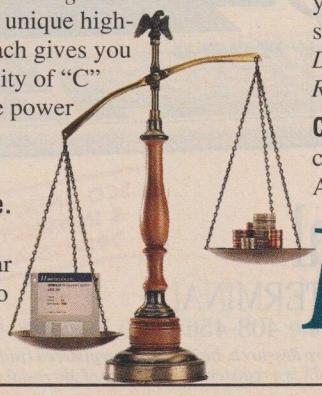

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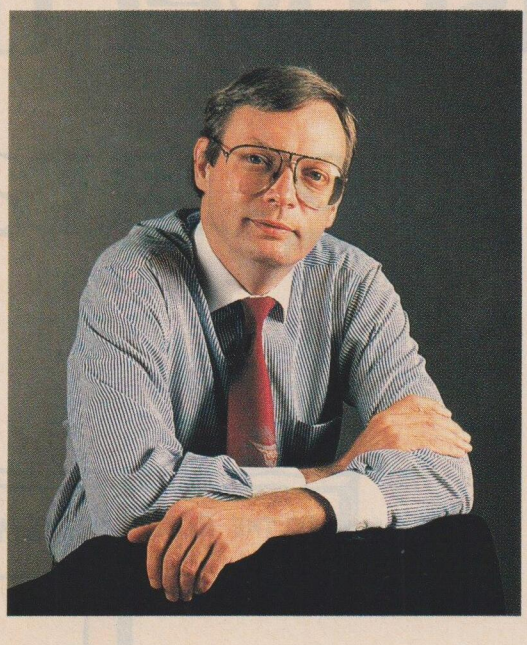

UNIX COMMUNICATES BY DESIGN

Personal computers are great personal productivity tools for all of us who need to write, work with spreadsheets, and store and retrieve data. But sending e-mail to remote locations with PCs was added as an afterthought, which partially explains why PCs are not very good at it.

You can use a PC to send mail to a service like MCI Mail, a bulletin board system, or an online data service like Compuserve, but it requires personal attention to details that results in a big waste of time. This has not stopped tens of thousands of people from spending untold hours doing this every day, however.

The reason UNIX outshines PCs when it comes to e-mail has to do with the needs of the programmers who wrote the UNIX operating system. To keep up with computer technology they needed to share ideas, insights, and experience quickly. So they built into the operating system the facility to send automated, person-to-person e-mail messages using wide-area networks or WANs.

When you use a computer with the UNIX to UNIX Copy Program (UUCP) your e-mail is automatically delivered to the addressee. All of the connections to other computers, message transfers, and delivery to the right people are handled by the operating system and the Internet–a network of WANs that literally covers the world. As a personal productivity tool, I think UNIX e-mail ranks with word processors, spreadsheets, and database management systems.

What many people don't know is that UUCP can be made to work with PCs running DOS and Apple Macintoshes, but you have to buy it as commercial software. We have reviewed several UUCP products for IBM PCs and a review is planned for a Macintosh product. We are also looking for a UUCP product that works with the more popular proprietary PC local-area networks (LANs). PC users should be able to send and receive e-mail as easily and productively as UNIX users can.

This month we look at several ways to help you take advantage of the e-mail services for UNIX and over the Internet. In Art Campbell's feature story, "E-mail Beyond UNIX" (pg. 77), we show how PC users can get messages from UNIX users on the Internet by using popular dial-up mail and online services, such as MCI Mail and Compuserve. Of course, these services allow PC users to send mail to UNIX systems as well.

The downside to the e-mail programs that come standard on UNIX is that their cryptic command-line interfaces can be difficult to use. However, as UNIX systems have continued their commercial growth, enterprising developers have met the challenge with "front ends" to the standard UNIX mail programs.

To look at the ways the UNIX e-mail interface can be improved, we asked Editor-at-Large Rick Farris to compare three front-end products. In his review, "UNIX Mail Gets Easier" (pg. 111), Farris considers the context in which e-mail is used with both character and graphical interface systems.

PC users need to add automated communication to the list of utilities that have popularized their computers and made them so productive. Office e-mail over PC LANs is trivial when compared to the power of UUCP and the WANs that can deliver messages to the far corners of the earth.

With improved user interfaces, UNIX continues to attract more personal productivity applications of the caliber found on PCs. And it's easier to bring great applications to UNIX than to fix operating systems that were never intended to communicate. ■

Dave Fiedler

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MFLOPS are LINPACK double-precision where n=100. AIX XL FORTRAN Version 2.1 and AIX XL C Version 1.1 compilers were used for these tests. SPECmark is a geometric mean of the ten SPECmark tests. All prices current at publication.

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CIRCLE NO. 136 ON INQUIRY CARD

DO PC USERS WANT SUN'S SOLARIS?

In a bid to challenge Microsoft and the IBM-Apple alliance, Sun Microsystems has announced a distributed operating system for SPARC machines and Intel 386/486-based PCs. Sun's new operating system, called Solaris, targets the large installed base of PC users that supposedly wants UNIX capabilities, but many users and software developers say there's low interest at the desktop for another UNIX operating system. The Santa Cruz Operation is currently the primary vendor of UNIX for 386/486s.

"There is no interest for another UNIX at the desktop level," says one analyst who follows *Fortune 100* companies. "The ACE initiative and Sun are fragmenting the market, they're causing obfuscation in the distribution channels."

Sun's introduction of its operating system is seen by many industry watchers as a move that is solely aimed at luring application developers away from Microsoft's NT operating system, which is due in the middle of next year. Sun's dominance of the RISC workstation market has recently been under attack with many companies banding together in strategic alliances–the ACE initiative and the IBM-Apple alliance–to develop standard interface operating systems for RISC machines and PCs. Its independence from these groups has made Sun appear as a pariah among vendors.

The Solaris announcement positions Sun more effectively, says Peter Rogers, an analyst with investment firm Robertson Stephens & Co. "Sun isn't an island anymore," he says referring to the support for Solaris from some large PC hardware and software companies–including Dell, AST Research, and Novell–that plan to bundle the product.

Solaris is based on SunOS 4.1.1, which has been renamed Solaris 1.0. It is currently available for laptops at $795, and in a workstation version for $1,395. Solaris 2.0 with System V Release 4 (SVR4) is to be available commercially by mid-1992 and will incorporate ONC, a networking standard; OpenWindows, Sun's windowing system; Sun's graphical user interface (GUI), Open Look; DeskSet, personal and workgroup productivity applications; and a framework for distributed object management.

Many large vendors are developing products with similar specifications, however. The ACE initiative–which includes Microsoft, Compaq Computer Corp., and Digital Equipment Corp.–and the IBM-Apple alliance were formed to develop advanced operating systems. The ACE initiative centers around Microsoft's NT operating system. It's still unclear when a release date for an IBM-Apple system will be.

WILL SUN ATTRACT APPLICATIONS?

Although Sun's move positions it well against the ACE initiative, it must convince PC users to move to its new operating system, and eventually move toward its RISC standard, SPARC. By making its operating system available for PCs, Sun hopes to encourage more software companies to produce application programs for its SPARC-based machines. One software company, word processing vendor WordPerfect, already supports SPARC and is considering a Solaris version for Intel. Scott Worthington, WordPerfect's UNIX division marketing director, says he hasn't heard of any Intel-based users asking for a Solaris version of WordPerfect, however.

Some analysts say the ACE initiative, the IBM-Apple alliance, and the recent Sun announcement have hopelessly damaged the UNIX market. "This endless jockeying [by vendors] is hurting the market," says one analyst. "All of these guys are blowing their own feet off."

continued

X/OPEN TURNS TO USERS

Which standards groups do you believe? Forrester Research Inc. recently interviewed MIS managers at *Fortune 1000* companies and asked, "Which standards groups do you look to for direction?" 52% of the respondents said "none"; 24% said IEEE/Posix; 17% said Open Systems Interconnection; 11% said the Open Software Foundation (OSF); 5% said X/Open; and 19% said "other."

This study is indicative of the difficulties X/Open, an open systems standards organization, is experiencing. It has recently gone through a major realignment to work more closely with users and software developers, but many industry watchers are wondering if the move has come too late.

"I'm not sure if X/Open can overcome its heritage," says Bud Huber, chairman of the User Alliance, referring to X/Open's traditional reliance on vendor support. He says vendors supporting X/Open might not support a user-developed vision. Although X/Open has always encouraged user support through its User Council, its owners, including Fujitsu, Hitachi, NEC, Sun, ICL, NCR, OSF, and UNIX International, are hardware vendors or vendor-driven consortia.

Despite the difficulties of realigning as a user-oriented organization, the reorganization will give users a more decisive voice in the organization through the X/Open User's Council, says Robert E. Lewin, X/Open's vice president of North American operations. Some users have criticized the organization for lacking a unified goal after the fragmentation in the UNIX market that has been brought on by vendor alliances. But X/Open plans to expand its role as an integrator by guiding vendors, software developers, and computer users toward more common standards.

X/Open hopes to bring users together to present a unified voice to vendors, but reaching the goal may be difficult. The group has set a meeting for November 13 to 15 in Reston, Va., to address security, user interfaces, network management and administration, and application support issues. Unifying a diverse group of users in concert might be difficult, but users interviewed say they are determined to work together.

"I don't want open systems to be the great promise that fell on its face," says Charles M. "Mack" Gardner, executive director at PRC, a systems integrator involved in X/Open.

PENS COME TO UNIX

Pen-and-tablet computers are the latest rage for PCs–lightweight portables and notepads that let you write commands instead of typing them. UNIX may not be far behind. IBM is demonstrating a prototype tablet that functions as an X Windows terminal, but with the keyboard and mouse replaced by a stylus.

The IBM tablet uses an extended version of X11R4, the current release of MIT's X Window System, along with Motif and a custom widget set. The X extensions detect whether the stylus is being used in a "pen-aware" window; if not, the stylus functions almost exactly like a mouse, and touching the screen serves as a mouse click. If the application in the window is designed for pen use, the tablet will translate handwriting into ASCII text or translate special shorthand pen notations.

IBM researcher Doris Chow says the tablet is currently a research project and wouldn't speculate on whether IBM intends to turn it into a product. However, Chow says the company has talked to the MIT X Consortium about including the X pen extensions in a future X Windows release.

SUN GETS INTERACTIVE?

In an attempt to sway more PC UNIX vendors toward its new operating system and capitalize on valuable PC distribution channels, Sun plans to acquire Interactive Systems, a Santa Monica, Calif.-based maker of UNIX for Intel 386/486-based PCs. The two compa-

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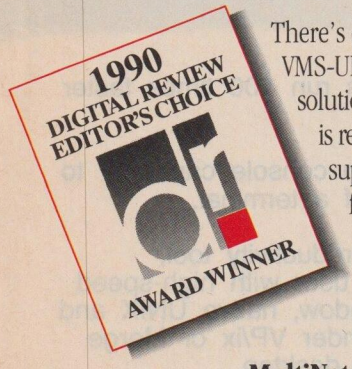

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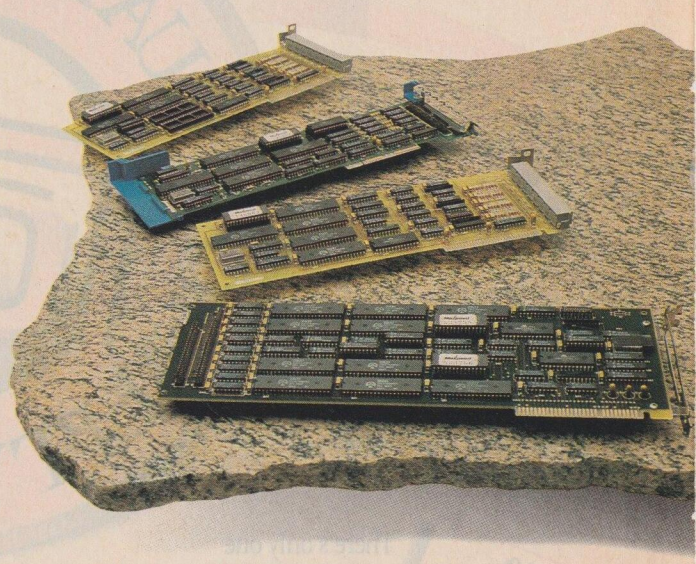

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CIRCLE NO. 170 ON INQUIRY CARD

nies have been discussing a closer alliance for several months, says Dennis Peck, Interactive's president and CEO.

Interactive is expected to generate $70 million in revenue this year. It was in charge of porting Sun's new distributed operating system–Solaris–to Intel 386/486 and has worked closely with other SPARC vendors. Although representatives from the companies refused to comment on any details of the buy-out, analysts say the deal makes sense. Sun needs Interactive's PC distribution channels if it hopes to succeed in migrating PC users toward its SPARC-based workstations. Interactive, which is SCO's primary competition in packaged UNIX, has become an isolated entity because of its non-involvement in the ACE initiative, say analysts.

FUJITSU'S BIG YEN FOR HAL

Hal Computer Systems, a year-old UNIX systems vendor founded by former IBM Fellow Andrew Heller, has found a friend with deep pockets. Fujitsu is buying 44% of the Campbell, Calif., startup for $40 million. Fujitsu's part in Hal's future goes beyond money, though. Hal expects Fujitsu to manufacture its superscalar CMOS SPARC CPUs that will be the heart of its SPARC-based machines.

While Fujitsu's decision to buy into Hal is good news for the smaller company, Hal itself remains a mystery. The company hasn't released any products and won't say when it will. In fact, a Hal representative would only say that the company intends to create "a family of high-performance computer systems" based on SPARC and UNIX and aimed at commercial users. Some analysts speculate that Hal's product could be a high-end server that would compete with mainframes from Amdahl Corp., another company that has received Fujitsu capital.

While Hal may be mysterious, its founder isn't: Andrew Heller was in charge of IBM's Advanced Engineering Systems Independent Business Unit when it produced the RS/6000 workstation.

AMD HITS INTEL WITH $2 BILLION LAWSUIT

Chipmakers Intel and Advanced Micro Devices are headed for court again. AMD has filed a $2 billion antitrust suit against Intel, claiming that Intel has monopolized the PC microprocessor market by lying to AMD and threatening system vendors.

In the lawsuit, filed in U.S. District Court in San Jose, Calif., AMD repeats the claims it has been making since 1987 that Intel violated a 1981 licensing agreement with AMD and lied to AMD about its intentions in the agreement. The new suit goes further, alleging that Intel is threatening customers with a cut-off of 386 and 486 chips if the customers do business with AMD. AMD has asked for $2 billion in damages, which could be tripled to $6 billion under federal antitrust law.

Intel and AMD have shared plenty of courtroom time together since 1987 when AMD sued its erstwhile partner over the 1981 licensing agreement. That case ended up in court-ordered arbitration and the arbitrator is expected to deliver his opinion by the end of 1991. AMD says the end of the arbitration freed up the legal team for the new federal lawsuit and provided some of the evidence for AMD's antitrust claims. Intel has also sued AMD, claiming copyright infringement for several chips, in a suit that is still pending.

THE WORST KEPT SECRET IN THE GALAXY

Sun recently took the wraps off its three multiprocessing servers, code-named Galaxy. While Doug Kaewert, Sun's director of server and board product marketing, insisted that, contrary to previously published reports, "We're not hurrying [the release in any way]," he acknowledged that beta sites have only had the servers since mid-August.

Current users of Sun SPARCservers can upgrade to the new 600MP series' three

machines with a board swap. The SPARCserver 330 upgrades to the 630MP, the 470 to the 670MP, and the 490 to the 690MP. Each comes in two-processor configurations (ranging in price from $45,000 to $92,000) or four-processor configurations ($57,500 to $104,500). Cost to upgrade to four processors on any system, using an MBus-based daughterboard, is $12,500.

The servers use the SunOS 4.1.2 multiprocessor-capable operating system. The newly announced Solaris operating system is 4.1.1, and Sun Microsystems (as opposed to SunSoft) has added multiprocessing extensions. Preliminary mips rating is 55 for the two-processor machines–just under HP Apollo's Series 700 uniprocessor desktop machine–and 100 mips for the four-processor machines.

Kaewert was unsure how Sun would position the 600MP series against Solbourne's established SPARC-compatible symmetric multiprocessing servers, because the new Sun machines are not fully symmetric. The 600MP series, according to Kaewert, is "not fully asymmetric, and not fully symmetric." He claims it has "a higher degree of concurrency than in asymmetric processing," which is an important factor in database processing. Comparable Solbourne two-processor machines range from a $24,740 server running at 52 mips to a $99,900 server running at 60 mips. Solbourne's four-processor versions range from $48,650 running at 101 mips to $130,900 running at 114 mips.

MEXICO'S CENTRAL BANK MOVES TO OPEN SYSTEMS

Indicating a fundamental shift in the way Mexico's central bank buys computers, the Nacional Financiera (NaFin) has moved away from proprietary systems toward open systems. NaFin has moved toward DEC for the UNIX-based Ultrix operating system and Oracle for its central databases. Mexican agencies have traditionally bought proprietary systems, and analysts allege that U.S. vendors have dumped unwanted proprietary systems that aren't selling in the United States or Europe into Latin American countries. The decision by NaFin indicates an internal policy shift toward open systems, which could slow proprietary sales and boost Mexico's UNIX-based systems market.

NaFin, headquartered in Mexico City, approves loans to support member banks. It holds an almost monopolistic role in Mexico, but the upcoming U.S.-Mexico Free Trade Agreement poses a threat to NaFin because Mexican banks will soon compete directly with U.S. banks to issue loans in Mexico.

SEQUENT SET TO RELEASE OBJECT-ORIENTED SOFTWARE

Sequent Computer Systems Inc., a maker of fully symmetrical multiprocessor systems, will release a software product that integrates object-oriented technology early next year. The product, Ptx/Object, could move Sequent toward a critical role in a $1.3 billion procurement contract, say sources close to the company. Sequent won't play a lead role in the Small Multiuser Contract (SMC) procurement contract for the Army, Navy, and Defense Logistics Agency, but the subcontractor has been negotiating with Sequent for two years to develop object-oriented technology for the project.

SMC will establish networking standards for military users and provide multiplatform applications. Sequent's object technology will reportedly tap information from legacy systems and convert it to objects which will save an enormous amount of time because programmers won't have to build or rebuild programs.

MALAYSIA STEPS TOWARD UNIX...SLOWLY

Malaysia recently joined the growing number of Southeast Asian governments favoring open systems and some vendors are already reporting increased interest in UNIX-based systems from public and private users. Malaysia's chief secretary of the government, Ahmad Sarji, says his government has asked its agencies to adopt open systems by 1992, but hasn't set strict guidelines for immediate adoption.

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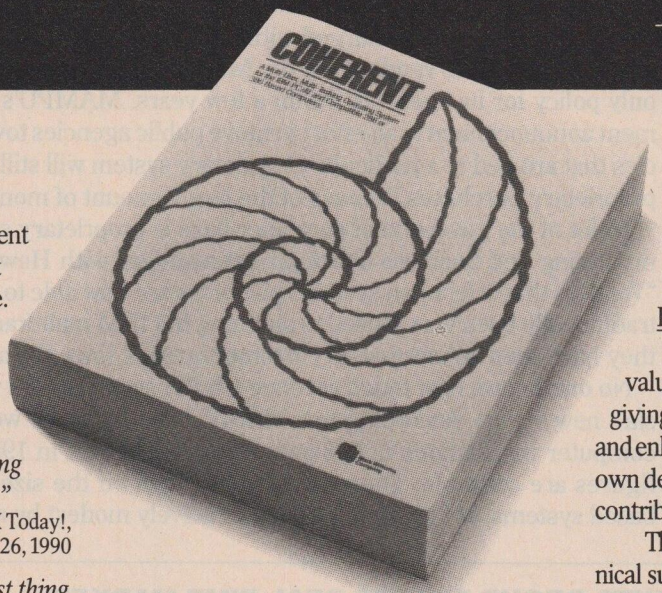
"I can't believe it's not UNIX."

–Sean Fulton, UNIX Today!



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"We must allow migration," says P. Venugopal, deputy director of the Malaysian Administrative Modernization and Management Planning Unit (MAMPU), a unit of the prime minister's office charged with overseeing the use of computer technology in the government. Some vendors say the Malaysian federal government could enact a UNIX-only policy for its agencies within a few years. MAMPU's Venugopal says the government announcement is an effort to move public agencies toward open systems, but agencies that are tied to a particular proprietary system will still get approval for incremental proprietary purchases because of the large amount of money tied up in closed systems.

"A lot of the government computer base is proprietary systems," says Ghazie Ismail, marketing and business development manager with Hewlett-Packard Sales Malaysia. "Vendors that offer open systems platforms are now able to compete in a market that has traditionally been very closed to anything but IBM mainframes." HP representatives say they have seen an increase in customer queries since the announcement.

No one knows how much revenue UNIX-based vendors will gain as a result of Malaysia's new stance. According to a MAMPU survey, there were 393 mainframe and minicomputer installations in 636 government agencies in 1989, the latest year for which figures are available. There is no breakdown on the size of the government's UNIX-based systems, but it's thought to be relatively modest by analysts.

SOFTWARE COMPONENTS GROUP ENTERS REAL-TIME MARKET

The Software Components Group has entered the UNIX real-time market with Chorus Systems. SCG will use Chorus' Chorus/Mix microkernel-based operating system to produce a UNIX-compatible, real-time operating system, says Alfred Chao, SCG's president and CEO. The San Jose, Calif.-based SCG is a real-time operating system vendor with $12 million in revenues.

OVERHEARD

"It's very confusing. I spend almost half my time trying to explain what it means."–SCO executive vice president Doug Michels at SCO Forum commenting on the ACE initiative.

When the subject of a standard GUI comes up, everyone's favorite metaphor is the consistency of the automobile's user interface. Unfortunately, that may be changing. Recently, in Seattle, Wash., a *UNIXWORLD* editor rented a Ford Thunderbird that would start only if the driver pushed on the brake instead of the accelerator.

PC software developer and industry guru Peter Norton, in his keynote address at the Fed Micro '91 conference, on UNIX: "I don't like it. But it's here, especially in government, and being used. It's here to stay for better or worse–I think worse....It's a necessary evil, like OS/2."

MIPS Computer Systems' John Mashey, at SCO Forum, on Intel's claims that its next generation of PC CPUs will combine CISC and RISC: "If it looks like a duck, walks like a duck, and quacks like a duck, it's a duck. And no matter how many feathers you put on it, it still has to carry those big feet around."

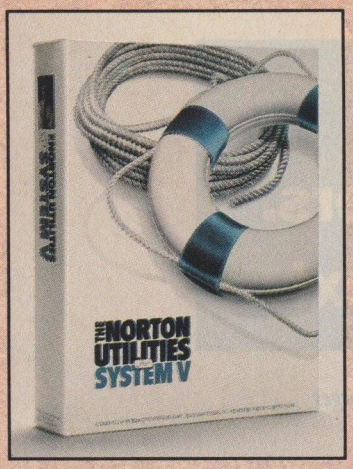
"The workstation market went from zero to $6 billion. The only market that's grown more is illegal drugs."–John Doerr of venture capital firm Kleiner Perkins Caufield & Byers.

AMD Chairman and CEO Jerry Sanders on Intel's monopoly on PC CPUs: "A continuation of the Intel monopoly will have the ultimate effect of turning the U.S. personal computer industry into the manufacturing-sector equivalent of the U.S. Postal Service."

Intel President and CEO Andrew Grove, on AMD: "What we have here is the Milli Vanilli of semiconductors. Their last original idea was to copy Intel."

–Edited by Gary Andrew Poole with staff reports. Please send any breaking news or comments to him at: **uunet!uworld!garyp** *or* **garyp@uworld.com.** *Or call him at 415-940-1500.*

Use it or Lose it.



The same cry is heard every day all over the world. It goes something like this: "I just lost my (pick one—payroll file, 10 years of customer history, the 1990 U.S. census) and I don't have a backup. Can somebody help me, pleeeeeeeease?

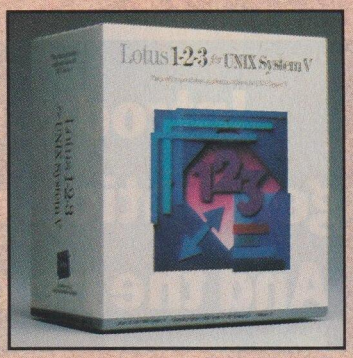
If you've installed The Norton Utilities, the answer is YES. With its famous UnErase Tool, this is the one utility that is indispensable.

Call before it's too late. Because it's not a matter of if you'll lose data, it's when.

The Norton Utilities for System V includes: • UnErase • Disk Explorer • Disk Test • Text Search • WipeFile • And much more.

IN 011 Norton for SCO UNIX **$229**
IN 012 Norton for Interactive/AT&T/Intel V/386 .....**$229**

UNIX spreadsheets easy as 1-2-3.



What happens when the spreadsheet standard meets the UNIX standard? A lot of happy users....

This is the spreadsheet that works like 1-2-3 because it really is 1-2-3. In fact, it's even better than the PC version in some respects. For example, with the UNIX multi-user edition you can calculate in one task, print in another, all the while you input in another! That's not all. There's support for Postscript printers and password security features to protect sensitive files.

Lotus 1-2-3 includes: • 3D Worksheets • Larger working space • Many Graphics Options • Support for UNIX features.

LO 004 Lotus 1-2-3 for UNIX System V (or Sun4) 1-User .....**$ 595**
LO 066 Lotus 1-2-3 for UNIX System V Multi-user.....**$1085**

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Love your PC? Want your X applications on your PC? Don't fret and don't let "them" tell you your PC has got to go. Whether you have DOS or Microsoft windows you can now tune to channel X with our PC to Unix connections. Site licenses available.

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XTREE helps you gain control of your files and directories. This is the favorite tool of thousands of PC users and now it's available to everyone who "graduated" to UNIX V/386 (or 486).

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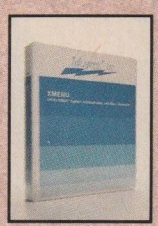

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Introducing the next generation of UNIX servers. And the next. And the next.

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Introducing the SPARCserver™ 600MP Series.

Today, they are the fastest, most expandable servers in Sun's history of fast, expandable servers. Tomorrow—literally—you can transform them from two-processor servers to four-processor servers.

And then, just when you've had time to catch your breath, you can step up their capabilities again with the soon-to-be-released Solaris™ 2.0 system software (based on UNIX® System V Release 4).

Each new SPARCserver system can be equipped with up to four processors for 90.3 SPEC throughput. That kind of blistering speed is just the ticket for faster file service, or blazing through the corporate databases (like Informix,® Ingres,™ Oracle,® or Sybase®).

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Besides running the 3600 applications written for the Sun platform, our new SPARCservers will upgrade easily to Solaris 2.0 —a symmetric multiprocessing environment. And it'll be just as easy to upgrade to the next generation of SPARC chip when it comes along—just plug in a new SPARC module.

So now that server technology has taken three steps forward, perhaps you should take a step toward the phone. Just call us at (800) 426-5321 ext. 300, and we'll rush you more information about the new SPARCserver 600MP Series.

They're going fast. And faster. And soon, even faster.

sun microsystems

*SunSoft, Inc.'s Solaris 2.0 is scheduled for release in the first half of 1992.

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This is Sun's fastest, most expandable family of servers ever – the new SPARCserver 600MP Series. Performance you'd expect from a multiprocessor server, at prices you'd expect from Sun.

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For heavier workloads and more users, plug in this SPARC module and you've upgraded from two CPUs to four. Because you don't buy an entire system board, you don't spend a fortune.

Soon

*The next generation of UNIX servers will yield even more powerful capabilities with the arrival of the next generation of client-server system software.**

CIRCLE NO. 227 ON INQUIRY CARD

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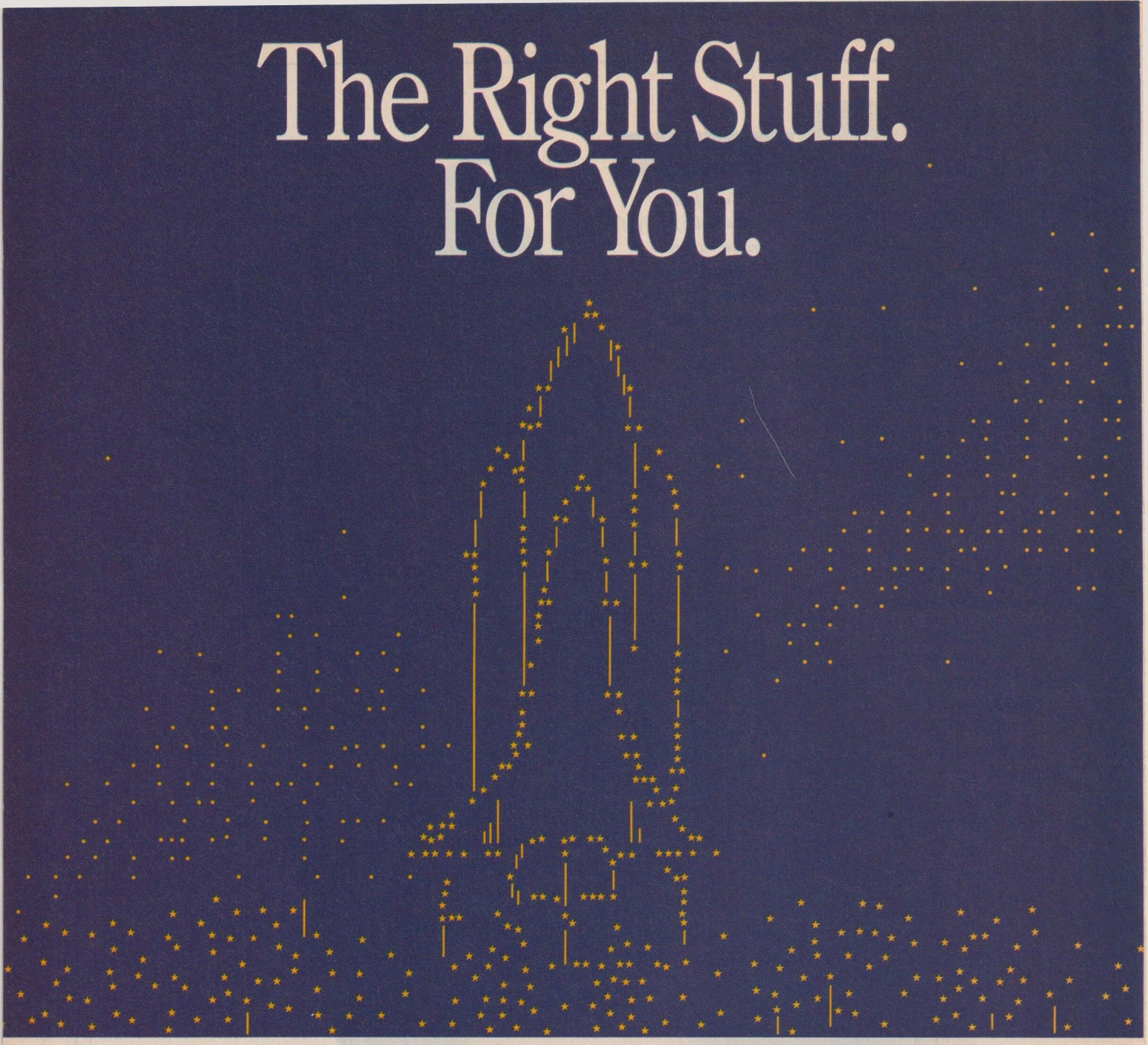

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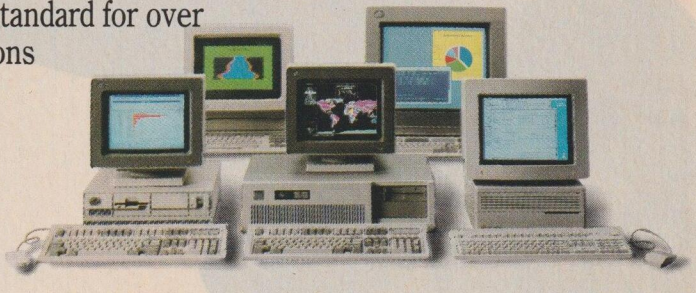

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CIRCLE NO. 174 ON INQUIRY CARD

YOUR ARTICLE WAS INSPIRATIONAL

Dear Editor:

I was greatly impressed by the July 1991 profile of Roger Sippl, "Sippl the Survivor," by Gary Andrew Poole. I feel that the publication of such high-quality articles on this subject offers a tremendous boost to people who have suffered from ill health and who often feel that there is simply no point in trying anymore.

By my late thirties, having grown up through the engineering environment and having become the managing director of my own company, I suffered a spinal injury which left me virtually unable to walk for four years. Those four years were absolute hell and only with the support of my wife and by struggling to do something new every day, was I able to make any sort of recovery.

During that black period I was introduced to computing by a neighbor–I had never touched a computer before–and this proved to be my mental savior. I was able to exhaust my frustrations through this new environment and actually use my previous engineering and business experience to some practical end without the need for mobility.

Five years later I am systems and administration manager for a specialist manufacturing company, can walk quite well, and live a fairly normal life.

I sincerely hope that your article reached others who need to see that when all is black, sometimes there is a little light at the end of the tunnel. And sometimes that light is not the headlight of a train coming the other way.

Robert Farmer
Gwent, England

Rating Productivity vs. Performance

Dear Editor:

In your August 1991 issue, "The Serlin Report" and "The Next Generation of RISC Chips" point out how much time is spent comparing the raw performance of computers. I submit that bottom-line productivity is more important than mips, SPECmarks, CISC, or RISC.

I have two similar 386 computers: one runs UNIX System V/386 and X Windows, and the other runs MS-DOS and Microsoft Windows 3.0. While acknowledging that the UNIX system is technically superior in every way–I am far more productive on the DOS system.

Part of the reason for my greater productivity on the DOS system is the larger number of applications and software tools I have for it. DOS programs in general have more features, better functionality, are easier to use than their UNIX counterparts, and typically cost one-third to one-half what comparable UNIX programs cost.

Productivity aside, the performance obtained from a computer depends as much on the software as on the CPU. If you are running a word processor, almost any computer is up to the job. Even if you are running a computer-aided design program, a large percentage of your time is spent entering the drawing into the computer at human speeds. Performance also depends on how efficiently the software is written. For example, I have several C compilers for DOS which compile at significantly different speeds on the same machine–and most of my DOS C compilers are faster than the C compilers I have for UNIX.

Don't get me wrong, I'm not in love with DOS or Windows. I'm merely trying to point out that, for many applications, productivity is more important than performance and productivity is not dependent on any one CPU or operating system.

Dave Eriqat
Syntel Design
San Francisco, Calif.

Coconet Counters Coverage

Dear Editor:

We would like to point out several problems we found in your August 1991 review, "Bulletin Boards for Business."

First, we challenge the author to cite evidence justifying his questioning the "long-term service and support" provided by the vendors in the article. We provide extensive, prompt support services to our customers at no additional charge.

Notwithstanding the author's statements, Coconet Host does support real-time conferencing. And there is a reason for supporting only one file transfer protocol: the Access Program only needs one.

We were especially dismayed by the fact that only passing, and inaccurate, mention was made of our CocoTalk API C Library, especially considering that *UNIXWORLD* requested two copies for review. CocoTalk is a toolkit for creating custom, self-contained, graphical applications that can be accessed while using Coconet Host. CocoTalk is a major feature of our product line, practically all of our customers have it, and none of the other vendors offers it, so we can't understand why the author ignores it.

Finally, the author mentions the availability of future options in other vendors' products, but fails to mention that our upcoming release will support UNIX mail, Zmodem file transfers, and archival of real-time conferencing records.

Brian L. Dear
President
Coconut Computing Inc.
La Jolla, Calif.

Editor-at-Large Mike Burgard responds: As the chart and article point out, Coconet Host supports online conferencing, but not conference retrieval or archiving. The remarks about support relate to the small size of these companies–two to five employees–and the fact that a simple event, such as an illness or accident, can cause an interruption in support.

Space did not permit a more in-depth discussion of CocoTalk API. CocoTalk API is indeed a robust and C-like tool for creating complete applications. I unintentionally neglected to mention that Coconut Computing is planning a new version of the product.

Shocking Language

Dear Editor:

In your August 1991 "Mail" column, John Zeljeznjak writes that he is "literally shocked" by the price of the Apple Macintosh with A/UX. I infer from this that either your magazine has a real static problem, or someone wired his copy up to 120 VAC.

Dennis Taylor
Pacific Corporate Trust
Vancouver, Canada

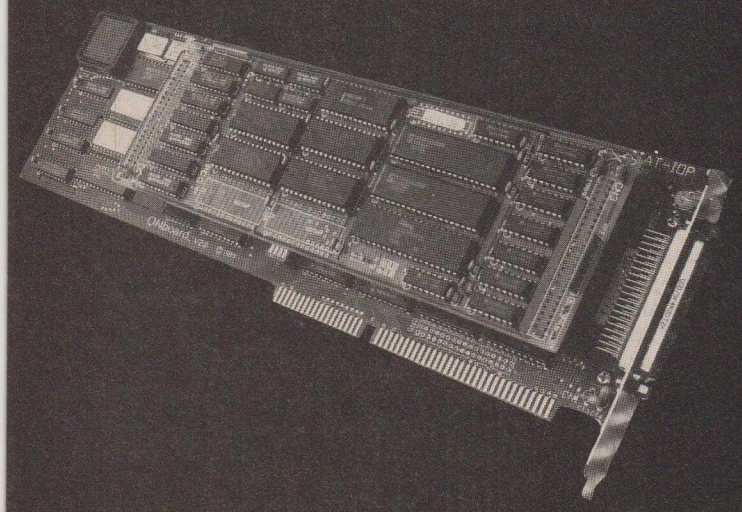
More Ways to Program

Dear Editor:

In the August 1991 review, "New Ways to Program in Object-Oriented X," you featured two products that provide C++ interfaces to X Windows. For quite a while

Multiport Boards From Stallion

Best Performing



QUICK! What's the first word that pops into your mind when you think of UNIX connectivity? We bet it wasn't "easy"-- especially when it comes to system maintenance. But Stallion's high-performance intelligent multiport boards are guaranteed to change your way of thinking.

Because Stallion boards have a totally unique feature: ***easy*** software tools that employ graphics to walk you through installation, maintenance and upgrades. No more thick and tedious manuals. Just simple, step by step instructions that will get the job done in no time.

Along with this simplicity comes a great deal of power and flexibility--from 4 to 32 ports in a single slot--to configure up to 128 terminals, printers, and serial devices per system. And Stallion's revolutionary ***easy*** software tools make all that connectivity simple to achieve.

Stallion has a team of specialists in UNIX connectivity. Call us today. We guarantee you'll start thinking "***easy***" when you think UNIX connectivity--and Stallion Technologies.

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Harnessing the power of UNIX

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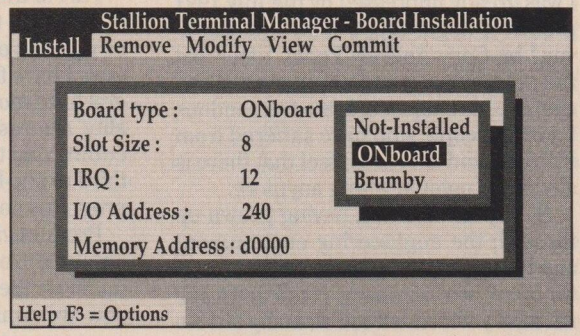
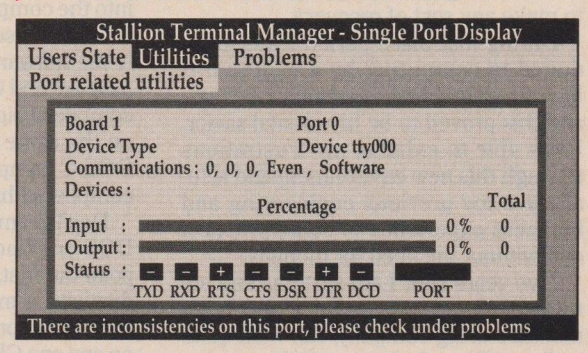
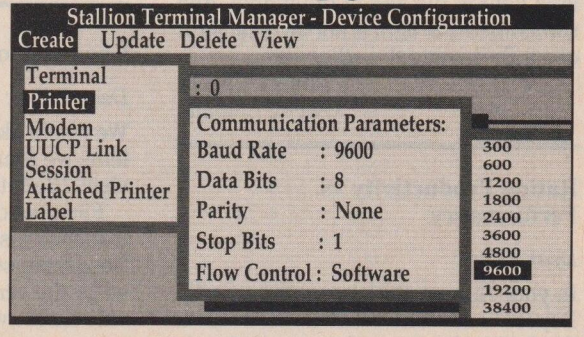


Easiest to Maintain



Easiest to Upgrade



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CIRCLE NO. 191 ON INQUIRY CARD

there has been a freely available C++ toolkit available called InterViews. InterViews was developed at Stanford University by Mark Linton and a score of others.

In the article you presented a "Hello World" program using Solbourne's OI toolkit. My program (shown below) does not have all of the bells and whistles it could, but with a few minutes' work I could have added a frame or a button.

Most interesting is the utility **ibuild**. I created a program that had both a "Hello, World!" message and a "Quit" button in five minutes using **ibuild**. I edited one file during this process to add one line of code.

The latest version of InterViews requires AT&T's cfront (2.0 or 2.1). However, there is work being done by myself and others to enable InterViews to compile with the GNU C++ compiler, which is also freely available.

```
#include <InterViews/world.h>
#include <InterViews/message.h>
#include <InterViews/glue.h>
#include <InterViews/box.h>

main (int ac, char ** av) {
   World *world = new World ("Hello", ac, av);

   world->Insert (
                  new VBox (
                           new Message("Hello, World!")
                           )
                  );
   world->run90;
}
```

Sean Eric Fagan
Cygnus Support
Palo Alto, Calif

Entering the Internet

Dear Editor:

I enjoyed your very informative article, "Will Success Spoil the Internet?," by Rik Farrow in the September 1991 issue. I am new to the Internet and was very interested in the news capability that was implied to exist. Does this exist? If so, can you point me to a source of information on how to gain access? When I was in graduate school I got used to having news via UUCP links and would like the luxury once more.

Charles Curley
Boeing Aerospace Operation Inc.
Kennedy Space Center, Fla.

Technical Editor Rik Farrow replies: The news capability does indeed exist, and is

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In 1860, The Pony Express was able to get mail from St. Joseph, Missouri to California in only 8 days. An incredible achievement.

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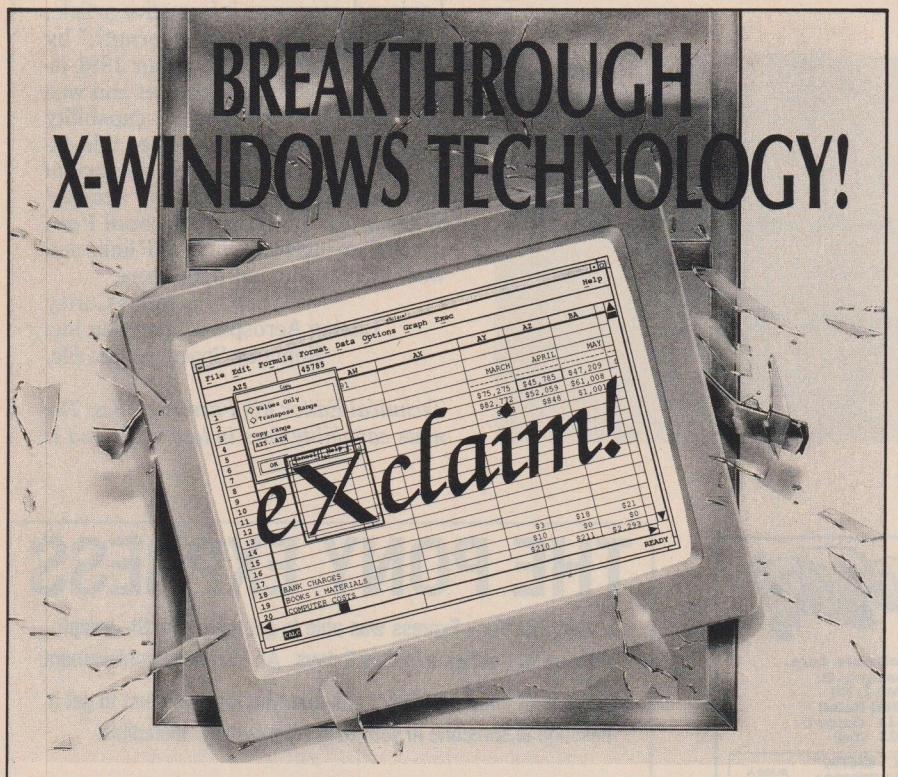
CIRCLE NO. 17 ON INQUIRY CARD

called Usenet. To start participating, you need to acquire, build, and install the news software, a process that was explained in the tutorial, "Installing Netnews," in the November and December 1987 issues. You may also need to find a news feed–another site already getting news–depending on your access to the Internet. O'Reilly and Associates has published two books about the subject, Using UUCP and the Usenet *and* Managing UUCP and Usenet, *which would also help you get going. Establishing a connection to the Internet will be the topic of a future* UNIXWORLD *tutorial.*



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CIRCLE NO. 69 ON INQUIRY CARD

Looking for Ways to Communicate

Dear Editor:

As a relatively new UNIX user, I would like to see an article about the different communication packages available for UNIX similar to the excellent article on terminal servers in your December 1990 issue ("Linking Terminals on the Ethernet").

When all of my communication was done from a PC, I discovered ProComm from Data Storm Technologies. However, now that I have a Telebit Trailblazer modem on my IBM RS/6000 model 320 UNIX machine, I would like to use it instead. I will still need to access DOS-based bulletin boards.

I would be grateful if you would consider my suggestion–I look to your magazine for information such as this.

William H. Dixon
Data Processing Manager
White Aluminum Products Inc.
Leesburg, Fla.

Products Reviews Editor Alan Southerton replies: Over the last 2 1/2 years we have reviewed Corporate Microsystems Inc.'s MLink, (February 1991), Communication Research Group's Blast (January 1990), and Century Software's Term (October 1989). Within the past year, we have also reviewed several bulletin board systems and terminal emulation programs. We are planning further reviews of communications software products in future issues.

CORRECTION

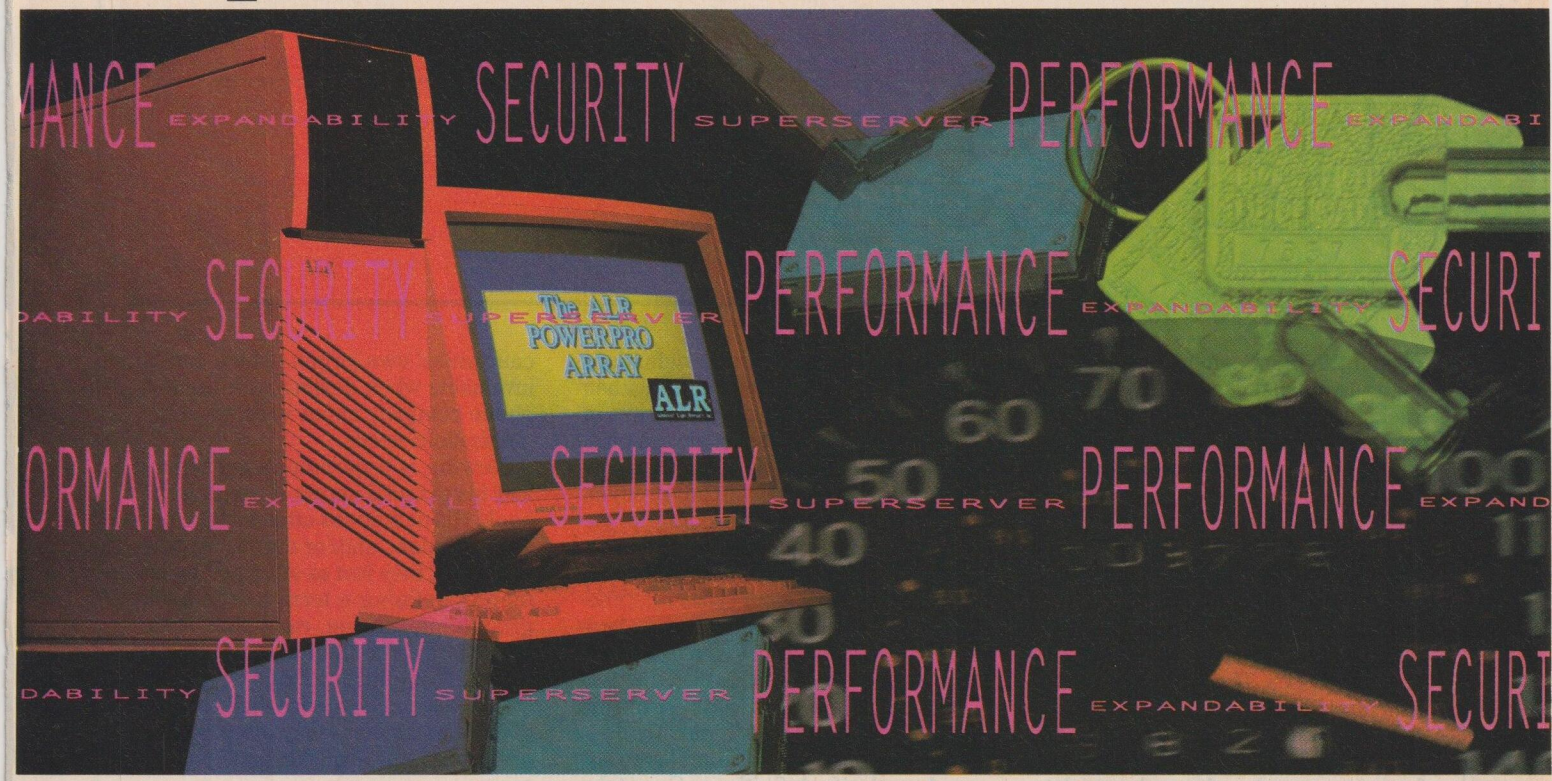
In the August 1991 article, "Is Unisys an Endangered Species?" Michael Batty's professional affiliation was misidentified. Mr. Batty is the chairman of the Use Inc. UNIX Working Group.

In the September 1991 "Product of the Month," the product's pricing structure was incorrectly described. Logos' prices range from $75,000 to $150,000 per language pair depending on *how many* language pairs are purchased. ■

UNIXWORLD *welcomes letters to the editor because your views matter to us. If you would like to comment on past articles, or voice your opinion on an issue, write to us at 444 Castro St., Mountain View, CA 94041, or send us e-mail at either of the following addresses:* **uunet!uworld!letters** *or* **letters@uworld.com.**

All letters must include an address and daytime and evening telephone numbers. Postal letters must be signed. We reserve the right to edit letters for clarity and space.

SuperServer



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And because the POWERPRO is designed to be *COMPAQ SYSTEMPRO compatible*, it has off-the-shelf compatibility with most popular dual processing multiuser and network environments.

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CIRCLE NO. 14 ON INQUIRY CARD

Reviewed by Walter Zintz

MAKING SENSE OF TECHNOBABBLE

Even the most coherent article in a trade journal can stop you in your tracks if you encounter a key word or phrase you don't recognize. A quick look in an ordinary dictionary isn't likely to get you going again, because even unabridged dictionaries can rarely keep up with the fast-changing insider jargon that is so often the only quick way to say things in the computer field.

Four specialized dictionaries have come to the rescue to guide you around these impasses. The first explains terminology from the core of computing itself. The other three define terms in fields closely related to computing. All four are comprehensive and up-to-date, making it likely that at least one of them can explain the unknown terms you encounter.

What's missing from these books is the pronunciation help that traditional dictionaries provide. All four books are great resources to help you understand what you read, but are lacking when you want to talk with colleagues using the coined terminology that makes up so much of industry jargon.

Computer Professional's Dictionary

By Allen L. Wyatt
Osborne McGraw-Hill; 510-548-2805
352 pages; 2,600 entries
ISBN 0-07-881705-6 paperbound; $19.95

As the word "professional" in the title suggests, this dictionary sticks close to mainstream computing. It defines an even distribution of hardware and software terminology, covering systems of all sizes, from personal computers (mostly IBM and Macintosh) to minicomputers to mainframes. The vocabulary starts at the simplest levels and consists almost entirely of material appropiate to users, administrators, and programmers as opposed to the esoteric terms of hardware designers and theorists.

You shouldn't fear that the definitions in this book will be more confusing than the terms they define. Wyatt writes in plain language and almost always manages to make his point clear in a few words. When you look up an acronym, you'll almost always find only its expanded counterpart as a definition, however. An unfortunate drawback is Wyatt's all-too-frequent cross referencing: the chances that you'll have to look up more than one term to find a satisfactory explanation are fairly high.

Graphically, this is the best of this month's books. Wyatt frequently uses drawings, diagrams, and tables to expand or clarify definitions. Gray tabs printed up to the edge of the page allow you to find the section of the alphabet you're looking for easily.

This dictionary will get you pretty far with general computing terms, but the minimal number of listings keeps it from dealing with the internal terminology of specific software packages or hardware lines. If you need a dictionary of UNIX-specific terms, the old reliable is *The C & UNIX Dictionary* by Kaare Christian, published by Wiley.

Review Highlights
Technical Level: Any
Understandability: Crystal Clear
Summary: Common terms from mainstream computing made clear

Newton's Telecom Dictionary, 3rd Edition

By Harry Newton
Telecom Library; 800-999-0345, 212-691-8215
536 pages; 4,600 entries
ISBN 0-936648-27-9 paperbound; $19.95

With the phrase "telecom," Newton is referring to the operating end of the telephone industry in general as it used in reference to data communication and voice calls. This book defines the phone companies' own jargon, which can be invaluable when dealing with the telephone company about your data communications needs.

Newton is a garrulous gentleman and his persona shows through in his book. His definitions often include personal opinions and/or digressive sidelights, but they just as often go beyond merely defining a term to add background information, examples, or details of how the item actually works. Newton's definitions don't typically stop at a single sentence–half-page explanations appear fairly often, and an occasional entry will run a full page or more.

Although the cover of the book states that the author is not an engineer–he's a Harvard MBA–his technical accuracy is quite good. Telephone business experience is not necessary to follow these explanations and you will only occasionally need to look up another term to understand a word or phrase's definition.

Review Highlights
Technical Level: Any
Understandability: Lucid
Summary: An invaluable guide to telephone industry jargon

The Language of Computer Publishing

By Donald J. Brenner
Brenner Information Group; 619-693-0355
221 pages; 4,600 entries
ISBN 0-929535-03-0 combbound; $16.95

In the context of this book, computer publishing extends beyond text-and-graphics computer systems to cover related fields including paper, typography, press printing, non-computer graphic arts, mass mailing, and the business of publishing. As far as computer publishing is concerned, both the specific terminology of individual

desktop publishing programs and relevant areas of general small computing are covered.

The author assures us in his foreword that he is not an expert in any of these fields–his background seems to be in the liberal arts–so his definitions aren't above the heads of non-expert readers or based on his own style of usage. Every definition here is derived from the usage the author found in current magazines and books, but this makes it likely that his definitions leave out certain meanings that he didn't happen to encounter.

Overall, this book is a rather good reference for people who are not yet experts in computers or publishing. The terms defined are mostly well chosen, and Brenner explains them clearly, without being overly terse or windy. There are a noticeable number of clerical errors, such as "pointed circuit" instead of "printed circuit," and at times he glosses over something he apparently doesn't understand himself, such as the point size of type. But for the most part he does his work well.

Review Highlights

Technical Level: Any
Understandability: Lucid
Summary: An introduction to the jargon of two arcane fields

Webster's New World Dictionary of Media and Communications

By Richard Weiner
Prentice Hall Trade; 800-223-4022, 212-698-7417
533 pages; 12,800 entries
ISBN 0-13-969759-4 hardbound; $29.95

Broadcast and cable television; radio; motion pictures; the stage; print and broadcast journalism; book and magazine publishing; expositions; and advertising and public relations are the major fields covered in this book. With a list this long, the author frequently has to preface a definition with the field, or fields, to which it applies.

This book is the most professionally produced of all the trade jargon dictionaries I've encountered. From the dustjacket to the individual pages, everything is designed with the elegant, but austere, look that spells big-time reference publishing. The author consulted an editorial advisory board consisting of some of the most august trade associations in the fields he covers. The book's definitions read like the work of an expert in media and, sure enough, Weiner is a well-established consultant and book author in the public relations arena.

Most of the terms you'll need to understand in doing business with any of these fields can be found in this book. Beyond that, the book is fun to have around–when you're watching the credits on the late movie and wondering what a gaffer or best boy does, this book will tell you. If you're curious as to how the name of a vegetable came to stand for an argument or a verbal fracas, looking up "rhubarb" here will answer that question. If you're ever puzzled about why CBS's headquarters is known in the trade as Black Rock, while NBC's is called Thirty Rock, this book will tell you.

The book has very few typos, the printing and binding are nicely done and, best of all, almost all the definitions are accurate and complete. The very large number of entries is appropriate for the wide range of fields being covered. The writing is terse, but clear, and too impersonal in tone to annoy anyone.

Review Highlights

Technical Level: Nontechnical
Understandability: Almost Crystal Clear
Summary: An excellent decryption of a lot of media jargon

BOOK BRIEFS

The Computer Industry Directory offers detailed contact information for more than 6,400 computer-related companies, most of them in the United States. Listings are arranged alphabetically by company name, with cross references by location, industries served, system compatibility, and product/service type. It's available at $49.95 from Mentor Market Research, 408-268-6333. ■

Editor-at-Large Walter Zintz is the Advisor Emeritus to Uni-Ops Books in Boonville, Calif.

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Omri Serlin

SVR4 MAY BECOME THE FIRST TRULY SECURE UNIX

Imagine that you have invented a new television tube that offers unheard of picture quality, many times better than the vaunted HDTV (High Definition TV). Amazingly, it requires *no* changes to TV stations' equipment. You'd love to launch a major advertising campaign, telling the viewing public to go buy your great invention forthwith.

There's only one hitch: due to its irregular shape, your magic tube can't fit in conventional TV sets and the TV manufacturers must revamp their designs and production lines to accommodate your invention. Until they do, there's not much you can do but grit your teeth and wait.

This is pretty much the dilemma faced by UNIX System Laboratories (USL). USL doesn't have a new TV tube–it has UNIX System V Release 4.1, the "Enhanced Security" (ES) release. SVR4.1 ES is the first, and so far the only, major operating system in the running for the coveted B2 security level certification from the U.S. Department of Defense. In addition, according to USL, SVR4.1 ES also supports a number of features required under the more stringent B3 level of the Defense Department's "Orange Book," which defines the requirements for secure computer systems.

Certifiable Security

Having UNIX certified at such a high Orange Book level is significant for several reasons. First, it will eradicate the widely held suspicion that UNIX is riddled with "back doors" that make it an easy target for hacker attacks. Second, by brandishing a high-security classification, UNIX can now compete better against the established proprietary operating systems from such industry leaders as IBM, Digital Equipment Corp., and Hewlett-Packard. Finally, although the Defense Department's Orange Book was created with military security requirements in mind, many of the same concerns are shared by commercial computer users in the financial sector and in a wide range of other applications. Such users are not yet eager to install UNIX, but are likely to be more receptive to a high-security UNIX.

Paradoxically, USL cannot aggressively promote this unique competitive advantage because USL doesn't sell directly to the public: its main distribution channel is the computer vendors that offer UNIX with their systems. The vendors, in turn, will need a lot of time to adapt their software to the new, secure software base. Vendors may also have to redesign some of their software to raise it to the same secure level as SVR4.1.

And even more time would be required for these vendors to obtain formal security certification for the software running on their hardware platforms. Such certification isn't granted on a generic basis: the entire hardware and software configuration is certified as a combined entity. And the certification process can take years. In fact, SVR4.1 ES itself, on an AT&T 3B2 platform, was still in the certification process in August of this year.

Military computer security concerns are shared by commercial users

Although it carries no formal security certification, the standard UNIX SVR4 has most of the features necessary to meet the relatively low-level C2 security classification, according to USL. A key feature SVR4 lacks is the audit capability, a facility that tracks and records each user's activities as an aid to identify suspicious behavior and help in damage control.

In the past, AT&T obtained a formal B1 certification for the AT&T 3B2 computer running the earlier UNIX SVR3 augmented with the specialized Multi-Level Security (MLS) software package. MLS added the needed auditing capability and other features, while leaving the standard kernel essentially intact.

This exclusively "add on" approach couldn't be used in SVR4.1 ES because the more severe B2 requirements necessitated some basic kernel modifications. It was clear that the reworking of the kernel to meet the B2 requirements would take a substantial amount of time. Meanwhile, the pressure was building for USL to provide some form of standard multiprocessing support in UNIX.

To solve this dilemma, USL, in cooperation with UNIX International, developed a two-pronged parallel development strategy. One effort, sponsored by a group headed by Intel Corp., set out to develop the so-called intermediate "MP" release without waiting for ES. The multithreaded kernel that is the key element in the MP release, is essentially the one developed by NCR Corp. in its Tower 800 multiprocessor. Other key contributors to the intermediate MP effort include Wyse Technology Inc., Olivetti Systems and Networks, and Unisys Corp.

The other effort, spearheaded by USL, forged ahead with the development of the ES release. A separate group of companies with key contributions from Sequent Computer, and including Pyramid Technology and Fujitsu Ltd., are developing the so-called "ES/MP" release. ES/MP will implement more extensive multiprocessing support than the MP release using the ES base. The ES/MP release will then be used as a base for future UNIX development.

To be comprehensive, it should be noted that a third parallel effort is underway: it is Sun Microsystems' development of release five of the SunOS operating system. This SunOS version will merge System V functionality with

the traditional SunOS Berkeley base. However, Sun has chosen to use its own multithreaded kernel development for this release, and it isn't clear if or how Sun plans to synchronize its operating system development with the mainstream UNIX ES/MP release.

What's in SVR4.1?

Here's a brief description of its key features.

Mandatory Access Control (MAC): MAC lets the system administrator restrict read and/or write access to information, in accordance with a corporation's security policy. The administrator defines who has access to what kind of information. Access can be controlled by a hierarchical structuring (Restricted, Proprietary, Private, and Public, for example), as well as on functional or "need to know" definitions.

MAC also allows the administrator to separate system administration functions from user functions. Thus, an administrative log-in can be restricted to perform only administrative activities such as file backup or adding new users. And a user log-in can be prevented from executing any administrative functions.

Discretionary Access Control (DAC): DAC enforces default security on all user files and activities. While the standard UNIX default is essentially the no-restriction case, DAC assumes that, unless specific permission is granted in the form of Access Control Lists (ACLs), all user files are inaccessible to anyone but their creator. Using ACLs, users can define who can have access to their files: other individuals, work-groups, or sets of groups.

Identification and Authentication Facility (IAF): IAF is part of the log-in process and ensures that only valid users can access the system. In standard UNIX, users identify themselves to the system by log-in name and authenticate their identity with a password. SVR4.1 ES includes a password authentication mechanism, but additionally provides facilities for implementing non-password authentication controls, such as fingerprint or retina scans, or magnetic card readers. This ability enables users to tailor the authentication process to match the type and degree of security they need.

Trusted Facility Management/Least Privileged Module (TFM): TFM provides checks and balances that keep individuals doing administrative tasks from putting corporate information resources at risk. Administrative permissions to perform tasks can be granted on a "per command" basis, so that a person doing an administrative log-in may do file backup, for example, but cannot read the information in the files being copied.

Trusted Path: This feature provides a direct connection between a user and the system during the log-in process. This is designed to combat such security breaches as "spoofing," which is possible in standard UNIX. In this type of attack, an intruder enters a program into the system that intercepts users' log-ins and pretends to be the normal log-in process–capturing the users' log-in names and passwords for illegal use.

Trusted Import/Export (TIE): When files have been corrupted or destroyed, users need a mechanism to restore those files to their previous state. TIE extends system backup/restore capabilities to recover not only files, but also the security level and access controls associated with the files, so that following the backup, system security is maintained.

Networking Security: SVR4.1 ES networking security features enable mandatory and discretionary access controls and administrative privileges to be utilized for file sharing services, file transfer, and remote command execution over the RFS and NFS remote file systems. This should make SVR4.1 ES attractive as the system of choice for gateways between internal corporate networks and external networks.

Much remains to be achieved in security for client-server systems

While this is a good start, it is clear that much remains to be achieved in security for distributed and client-server systems. One feature that can be added relatively easily is encryption protection for file transfers. Ultimately, security will eventually have to extend to the weakest link in the chain, namely desktop PCs or workstations. Physical access to network media will also have to be controlled.

Auditing: Auditing provides a clear trace of activity on a computer system by recording the actions of all users, including which commands were used, and which files were accessed, when, and by whom. Audit trails can help pinpoint suspicious activity in progress. In addition, such records can help to identify where a security break-in took place and assist in assessing the extent of damage done after unauthorized access has occurred. SVR4.1 ES provides extensive flexibility in the implementation of audit functions by letting administrators define how much system activity is to be recorded.

Performance Concerns

A common concern is the potential degradation in system performance as the security features are added or turned on. USL reports that SVR4.1 ES is very efficient in this respect. With all security features enabled, except auditing, SVR4.1 ES's performance is 96 to 97 percent of the non-secure SVR4. With all security features enabled, in addition to default auditing and journaling, SVR4.1 ES attains 93 to 94 percent of SVR4's performance. Finally, USL reports, when all security and auditing features are enabled, SVR4.1 ES performance drops to 85 to 90 percent of SVR4, a much smaller degradation than the 30 to 50 percent typically anticipated in that circumstance.

How is SVR4.1 ES packaged? In addition to the base product, there are four optional packages being offered to UNIX original equipment manufacturers (OEMs) and users. There is an Auditing Package, which with the ES base, meets the C2 security level. Next, the Enterprise Security Package adds mandatory and discretionary access control, which allows B1 and B2 levels in the United States, and the equivalent F4/Q4 European levels, to be attained.

The B2 Rating Kit provides OEMs and system integrators with tools to help reduce the time and expense involved in putting a system through the formal U.S. government certification process. The kit includes a Covert Channel Analysis tool, a certification test suite, and design documentation.

Finally, the Enhanced Administration and Networking Package provides new system management and electronic software distribution for SVR4 and SVR4.1 ES.

Given the increasing interest in security among commercial computer users, SVR4.1 ES should eventually pay off handsomely for USL. It's the right product at the right time and the pricing is right with no dramatic increase for the base ES package relative to SVR4. ■

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CIRCLE NO. 218 ON INQUIRY CARD

Even in clouded moonlight, the pair of golden ropes glowed as they hung silently from the towering castle ceiling. Suddenly, along one wall, a shadow began to move.

It was Nathaniel Hawkins, a most valiant and clever young lad from the valley below. He had come to retrieve these sacred golden ropes stolen from his village monastery by the evil knight. And there they were! Sixty feet long, hung three feet apart, and guarded by the knight's sleeping but savage panthers. Nathaniel inched closer, knowing if he jumped or fell more than 15 feet he would surely be caught. If not devoured. How does he recover nearly all the rope, equipped only with his courage and a knife?

Ingenuity seldom goes unrewarded. Trouble is, it usually takes a fair amount of necessity to trigger it. A large ladder would have made Nathaniel's task a lot easier. But silence was a prerequisite to success. So he had to work with what he had.

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In our industry, a question being asked increasingly these days is, "Are we working adequately with what we have?" Or is there a tendency to condemn last year's box to the junk pile in the interest of chasing the brand newest bell or whistle?

Now, since we are a maker of such constantly evolving machines ourselves, another fair question to ask is, "Why would Wyse raise this issue in the first place?"

For more information about any of the many Wyse products, as well as a complimentary poster of our 14-day Cerebral Aerobics Program, simply dial 1-800-GET WYSE. After all, you want to keep your organic personal computer in top shape, too.

(And when are we gonna tell you how young Nathan reclaimed the ropes, anyway? In a moment. Business before pleasure.)

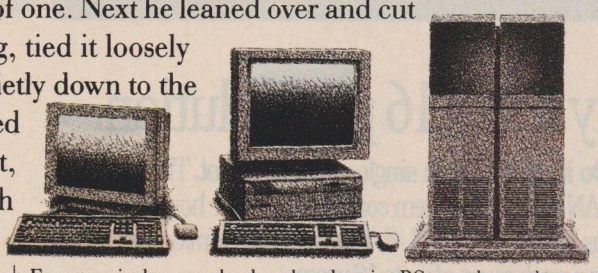
At any rate, the reasons we raise the issue of premature obsolescence are twofold. First, selfishly, to remind you that Wyse products are engineered to make obsolescence almost obsolete.

Our terminals, of course, are known for ergonomics that tend to be ahead of their time in the first place. Our new Decision PCs have surplus slots and bays so your configurations can change as your needs change. And our Series 9000i UNIX-based multiuser system is built on a unique architecture that can start with one 486 microprocessor and expand to include up to eight. Which results in over 160 MIPS of power. And all product lines are backed by a total service program to help ensure a long, productive life.

Secondly, we want to remind you (as if it were necessary) that things are tough out there. That the tighter we all run our ships, the better we'll all weather the storm. Whether that means recycling photocopy paper, carpooling to work or toughing it out with three-year-old PCs a little longer.

Of course, there are those times when entirely new equipment is entirely justifiable. Thank goodness. And in such instances, you'd be well advised to explore the many Wyse choices. Five monitors, 11 terminals, 10 PCs, and three series of advanced systems. All further evidence that ingenuity seldom goes unrewarded.

Speaking of which, were you as clever as our intrepid Nathaniel? He tied both ropes together at the bottom then scaled to the top of one. Next he leaned over and cut the other rope about a foot below the ceiling, tied it loosely around the rope he was on and let it slide quietly down to the floor. (The panthers barely stirred.) He then tied the one-foot piece into a loop, swung over to it, cut the remaining rope and threaded it through the loop. By holding both sides of the rope he quietly lowered himself to the floor, pausing only to untie the loose knot. He then pulled the rest of the rope (knot and all) down through the loop, caught it, and slipped off silently into the night. Not half bad for peasant stock.



From terminals, to notebook and workstation PCs, to advanced systems, Wyse offers one of the industry's widest product lines. The common denominators: advanced ergonomics, versatility, more power and features per dollar.

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CIRCLE NO. 36 ON INQUIRY CARD

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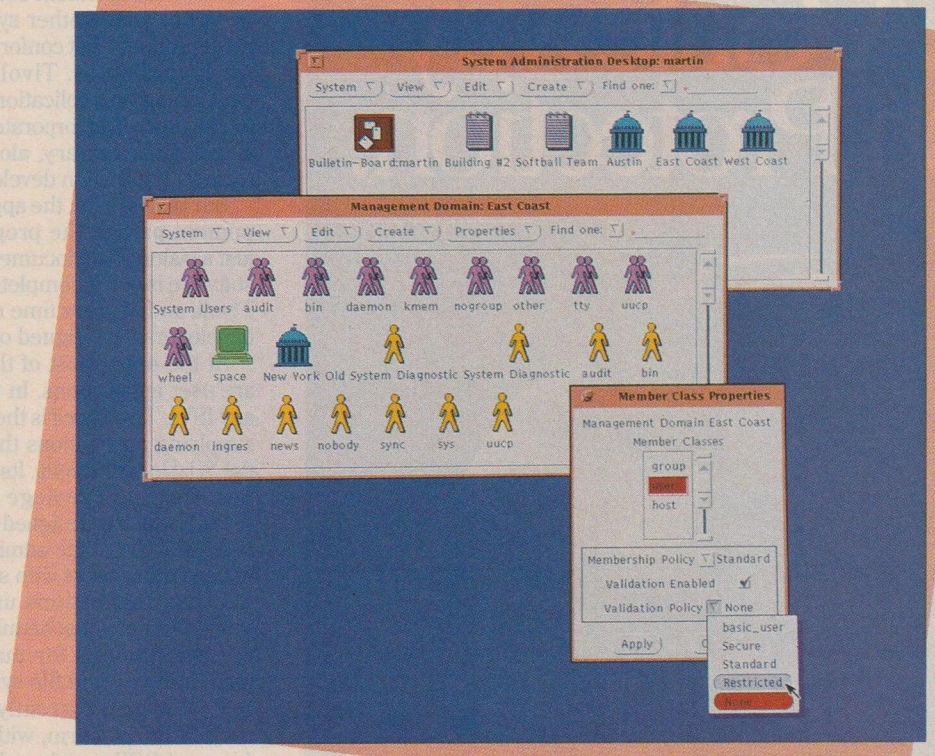
Can Tivoli Spread its WizDom?

By Howard Baldwin



Tivoli Systems' WizDom software is a system management solution for distributed systems

There may not be too many things that the Open Software Foundation and UNIX International agree upon, but one of them is that there needs to be a way to manage distributed systems. OSF has its plans for DME (distributed management environment), while UI has its plans for Atlas. You've probably heard about network management, but you may ask, "What's this system management stuff?" Good question.

According to Frank Moss, formerly of Lotus and now president of software start-up Tivoli Systems, "[Network and system management] have a lot in common given the problems they're trying to solve. Network management secures the network itself–communication facilities like gateways and routers." System management, on the other hand, handles computational resources and users throughout an organization and encompasses multiple departmental networks. "It's network management at a higher level," adds Moss.

Given that no one seems to have licked the network management problem (see "Just Say No," July 1991 *UNIXWORLD*), it's unclear why someone would want to move to a higher level of complexity. Nevertheless, that hasn't deterred Tivoli Systems.

Tivoli's WizDom software is designed primarily for system administrators, but its goal is to oversee users' interaction with their computers, rather than how the machines on the network interact with each other. Tivoli believes that, in general, system administrators are overworked. Their workload can be reduced by using a system management product that makes interaction with the system easier for users who, as a result, will be more likely to handle simpler tasks themselves. Some of the tasks Moss envisions users dealing with include unclogging print queues and administering mailboxes.

"System management involves an important human element. You're talking about human satisfaction dealing with the networked computer," Moss explains. With the more basic tasks handled by users, system administrators will have more time to deal with larger issues, such as security. Whether Tivoli's system management concept will be the time-saver for system administrators that Tivoli intends it to be depends on whether other organizations are swayed to Tivoli's vision. In September, Tivoli leapt one hurdle when WizDom was chosen by OSF to be the core of DME from more than 40 submissions.

The foundation of WizDom architecture is called Framework. Supported above Framework are two other levels: one each for application developers and users.

Framework encompasses WizDom's "core services" software: object services, dialogue services, base authorization, and base notification. These services allow the system administrator to handle security and communication. According to Todd Smith, Tivoli's chief scientist, "The lowest levels need to be simple be-

cause security is such a big notion. If we keep the number of individual notions small, then it's much easier to apply security properly."

Besides the core services, the base-level Framework software also contains the primary resource management (PRM) applications and the application development building blocks. The PRM applications are designed to organize the devices and users on the network into what Tivoli terms "management domains," which would each be different for separate departments. For instance, the finance department would require a more stringent password to access the salary database in its management domain than the human resources department would use for the company-wide telephone directory in its respective management domain. The application development software encompasses dialogue templates and applications templates, as well as groups of objects (as in object-oriented programming). The application development software is designed to enable the creation of the second level of Tivoli's structure–value-added applications.

It's this second level that Tivoli hopes will lure independent software vendors (ISVs) to create other system management products that conform to its Framework guidelines. Tivoli is currently developing an application development toolkit that will incorporate an Object Services Client Library, along with other tools for application development.

But at this point, the application development part of the program remains just a vision. The documentation for this software is still incomplete, according to Tivoli, and at press time no applications developers have signed on.

At the uppermost of the three levels are user applications. In the absence of any ISVs, Tivoli itself is the only company supplying applications that work under the WizDom umbrella. Its first offering is Security and Privilege Management (SPM), which is designed to authenticate users and distribute administrative functions to other users with some control.

Other applications under development, but not yet scheduled for release, are applications for management of mail, printers, and file systems. Written in C, WizDom currently runs only on the SPARC platform, with ports to platforms of OSF members like IBM, Digital Equipment Corp., and Hewlett-Packard under development.

Initially scheduled for release at the beginning of October 1991 are Framework and the PRM capabilities. Tivoli's listed prices range from $3,000 for 10 seats to $75,000 for 500 seats with site licensing available. The SPM software is priced at 50 percent of the PRM software price. The application development environment is priced at $5,000 per developers' seat.

Tivoli's goals for system management are worthwhile, but the question remains as to whether Tivoli can translate its vision and experience into a reality subscribed to by users and ISVs. The early backing from OSF helps, but so would the commitment of a group of software developers that shares Tivoli's vision. **Tivoli Systems, 6034 W. Courtyard Dr., Ste. 210, Austin, TX 78730; 512-794-9070.** ■

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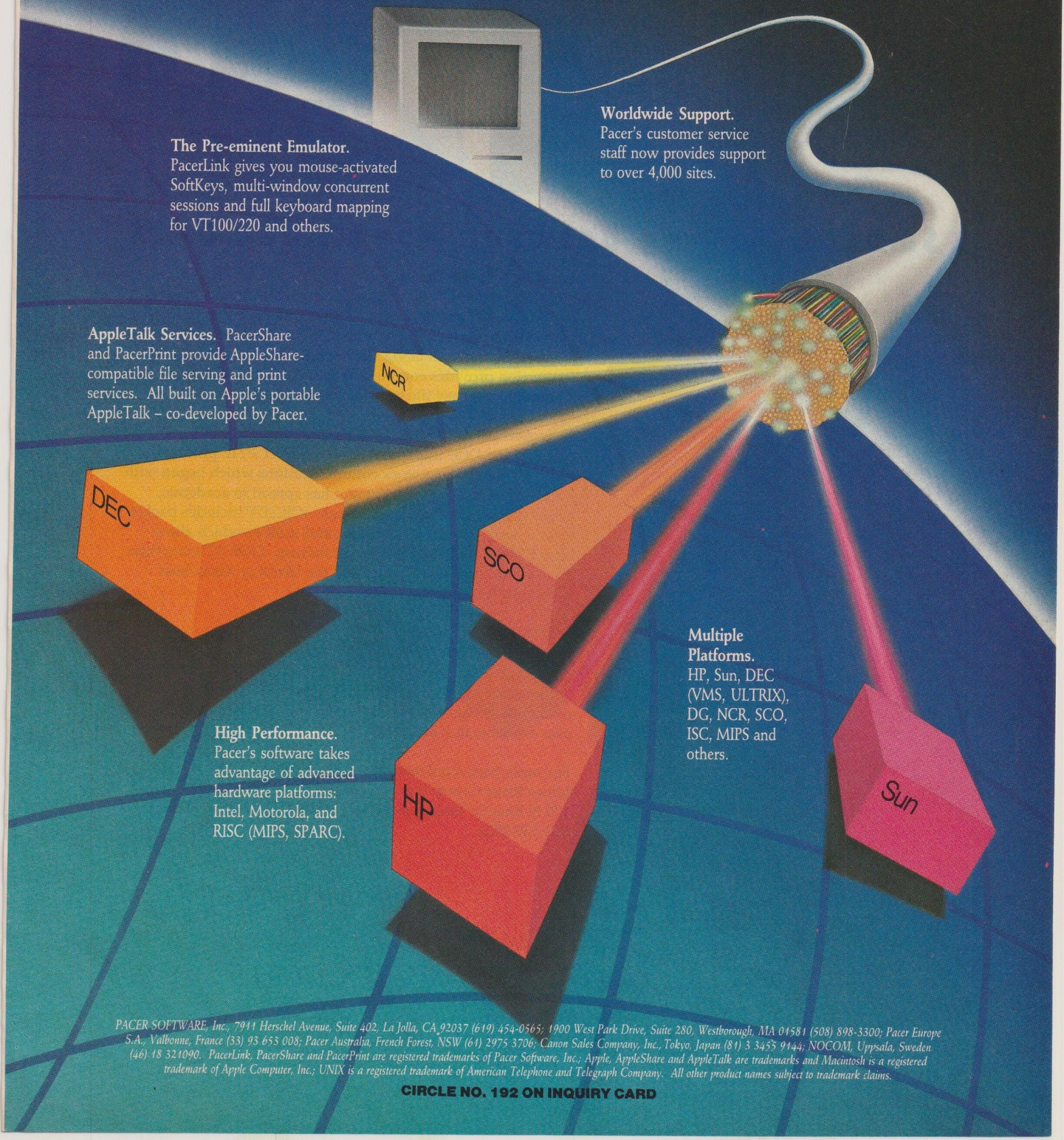

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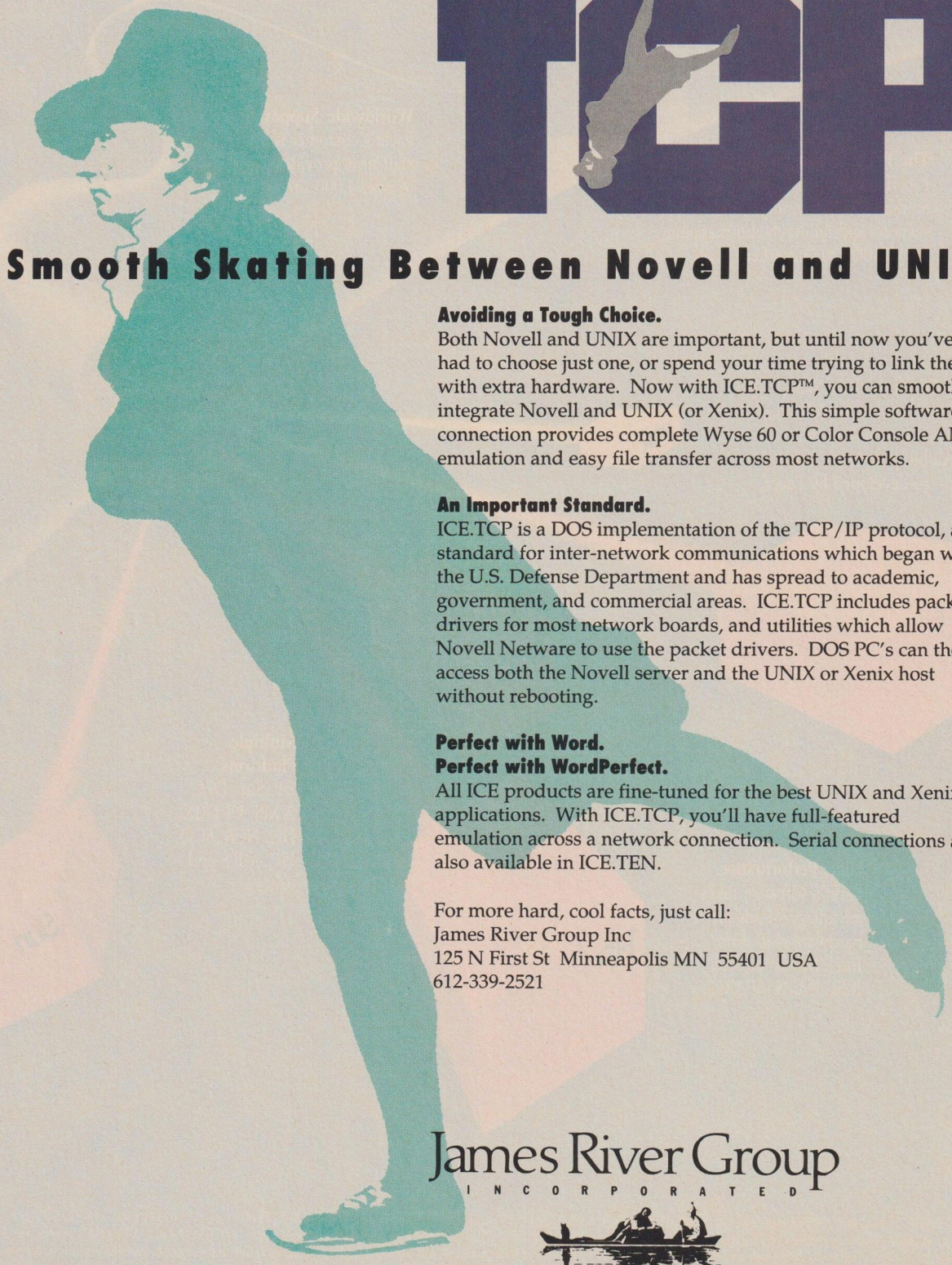

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Naturally Driven

By Gary Andrew Poole

FRANKLIN AVERY

TANIA AMOCHAEV, 42, BLEEDS INTENsity. The president and CEO of Natural Language Inc., a small company whose UNIX-based software has been chosen by Microsoft Corp. for its future natural language-based products, has a quick stride. She's sure of herself. Articulate. Smiles a lot, too. "She's a strong person," says one friend, "but she's a very gentle human being."

Despite her "gentle" side, there's an omnipresent edge in her voice. "There's a piece inside of me that's hard and unaccepting and I don't like that," she says, glancing at my notebook, "but I don't know if I want to see that in print."

The events that shape a person's life are not always easy to pinpoint, but Amochaev (pronounced Ahm-O-CHY-ev) decided her future when she was a little girl. Not that she decided to be the CEO of a company. Her goals were not so lofty. She simply wanted to shake the feeling that had overwhelmed her father.

She was born in Belgrade, Yugoslavia in 1949. In 1950, the communists invaded Yugoslavia and Amochaev's four-member family was forced away from their land to an internment camp in Italy. They stayed in wooden barracks, living in a six-by-ten-foot room–the "size of a public toilet," Amochaev says–for nearly four years. The family moved to San Francisco, Calif. when she was four years old. The experience crushed Amochaev's father, who died a few years ago. "He grew up feeling the world had done him in," says Amochaev. "I was damned if the world was going to take advantage of me."

Even growing up in San Francisco, Amochaev projected a diligent drive. "She was a strong-willed girl," recalls her 69-year-old mother, Zora. "She's still a little hard-headed," she laughs. Stubbornness is Amochaev's most pervasive trait, as her mother, brother, friends, and colleagues attest. She steadfastly refuses to admit the trait. "I'm tough," she says, smiling.

Much of Amochaev's determination came from years of climbing the corporate career ladder. She graduated with a bachelor of science degree in mathematics from the University of California at Berkeley. From Berkeley she went to Control Data Corp., where she says she fought for every position she

> "He [my father] grew up feeling the world had done him in. I was damned if the world was going to take advantage of me."
> —Tania Amochaev, president and CEO of Natural Language Inc.

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attained. "I don't mean a minor fight," she says. "I fought and I got what I wanted. I could have been destroyed."

At Control Data she worked as a programmer/analyst programming in assembly language, and went on to serve as a strategic planning manager, a director of the business office of computer systems, a general manager of a systems division, a general manager of professional services, and the international vice president of scientific information services. She was there from 1970 to 1984.

Her experience at the Minnesota-based company filled her life with emotional peaks and valleys. "When I first met her I was struck by her drive," says Hope Esparolini, a friend of Amochaev's in Minnesota. "I knew that she was brilliant."

Amochaev says was obsessed with proving her worth. She was pushy and abrasive (her words), but she was also an excellent manager according to people who worked with her. When she was in her early 30s she was put in charge of a group of about 175 people. "They hated Tania," says Bob Duncan, president and CEO of SPARC International, who was her supervisor at Control Data, "but within three months they would have slaughtered for her."

While she was with Control Data, Amochaev moved to France where she worked in a support division. She taught herself the language by reading French versions of *Nancy Drew* children's mystery books. She learned so quickly that she eventually taught a one-week seminar on "The Internals of the Cobol Compiler" in French. While in France, she grew tired of support work. She thought about quitting Control Data and traveling around the world, but then she attended a speech by Control Data's head of corporate strategy. She ripped his vision to shreds. She told him all the problems with the strategy and how it didn't meet the market needs. Her boss in France thought she would be fired, but the corporate executive hired her instead.

The Ghost

In the early 1980s Amochaev realized that she couldn't go any higher in the management ladder unless she wanted to be a Control Data careerist. She didn't. While at Control Data, she earned a fellowship at Stanford University's Graduate School of Business where she earned a master's degree in management. She recalls that period as a crucial time in her life. When she graduated from Stanford she realized that she had all the credentials to be a CEO. She no longer had to prove her worth to anyone. "I realized I was fighting a ghost that didn't exist anymore," she says.

In 1984, she was hired as the president and CEO of Comserv, a maker of manufacturing software. Control Data had recently saved the company from bankruptcy by buying 20 percent of its stock. Amochaev turned the failing company around and sold it for a profit.

The Comserv turn-around was probably her most dramatic professional success. Comserv was a company in turmoil. In the early 1980s, it experienced a series of quarterly losses, had its top management investigated by the U.S. government Securities Exchange Commission, missed a $1.1 million interest payment, and had its line of bank credit cancelled.

Amochaev used her brand of participatory and action-oriented management to move the company away from its complacency. After coordinating the company's merger with Management Science of America, Amochaev was recruited by Berkeley, Calif.-based Natural Language in 1987.

NLI was formed in 1984 when high school friends Jerrold Ginsparg and John Manferdelli left AT&T's Bell Research Labs to found the company. Ginsparg and Manferdelli didn't want to run NLI themselves because they were interested in research and development, not the day-to-day management of a business. "Running a business is a chore for us," says Manferdelli, NLI's vice president of research and development, who hates wearing suits. He says they recruited Amochaev because she was "smarter than everybody else" they interviewed.

"I'm a good thinker, I'm articulate, I'm aggressive, and I care a lot," says Amochaev. "I'm *very* intense."

Initially, Amochaev didn't want to work for a small start-up, but she sensed a shift in the market toward natural language front-ends for relational databases. "Tania could have had more secure and better paying jobs," says Jay Goldberg, who has worked with Amochaev in industry groups, "but she was interested in the challenge."

"She's not the classic CEO," says Manferdelli. "She manages best when people challenge her."

"She's not an airy-fairy person," drawls her former supervisor, Duncan, who is still a close friend.

As the CEO of NLI–a company with an estimated 1991 revenue of $7 million–Amochaev has to be a good strategist, says Duncan. He calls her the best strategist he's met. The company has exciting technology, but the natural language

market is in its infancy. The company has a lot of *potential,* but so far natural languages have been very slow to develop. Only 1,000 or so companies utilize natural language systems. In 1989, market research firm International Data Corp. reported that the market was only $14 million. It predicts that by 1993, however, natural language systems should be a more-than $150 millon market.

Amochaev's company hopes to capitalize on this projected growth with natural language interfaces to relational database management systems, including systems from Informix and Oracle. Natural Language runs on UNIX-based workstations from Sun Microsystems, Digital Equipment Corp., IBM, Hewlett-Packard, and Intergraph, as well as The Santa Cruz Operation's PC-based UNIX.

With a natural language interface, a user gives an English query and retrieves information in English. For example, if you want to know whose salary increased the most this year, you would type: "Show the salesperson whose salary increased the most in 1991." A natural language system would respond with an answer in English.

Despite the slow emergence of NLI, Amochaev has scored some victories for the 50-person company. She has raised over $7 million in venture capital funding. A second investment of $1 million came from Microsoft which now owns 10 percent of NLI. The investment gives Microsoft the rights to embed NLI's interface into several of its applications. The agreement is also aimed at extending English-language access to sources beyond relational databases, including future systems that may employ object-oriented and other techniques.

Happier Now

If Amochaev plays NLI's cards right, the company could dominate the natural language market. It faces competition from IBM, which has introduced SAA Language Access, but analysts say NLI's leading-edge technology and the backing of Microsoft should keep the company in a leadership position. Amochaev echoes their prediction. She says the company is passing its start-up phase and moving into mainstream acceptance.

"She's in a missionary area of the industry," says Comshare President Rick Crandall, who has worked with Amochaev in industry groups. Despite the small size of the natural language market, Amochaev is pleased with the progress of NLI.

She's pleased with her personal life too. She's married to Harold Hahn, a consultant who is a former vice president at Control Data, and has two stepchildren who are both in college. They live in San Francisco, but have 17 acres of land and a weekend home in California's wine country.

She's mellowed, say friends and family. "She's matured," says her brother, Alex. "The brashness of youth has been replaced by tolerance."

With her determined intensity, she's shaken the feeling her father possessed. She knows the world won't do her in. "I'm happier now than when I was 20," she says. "I haven't always been happy." ■

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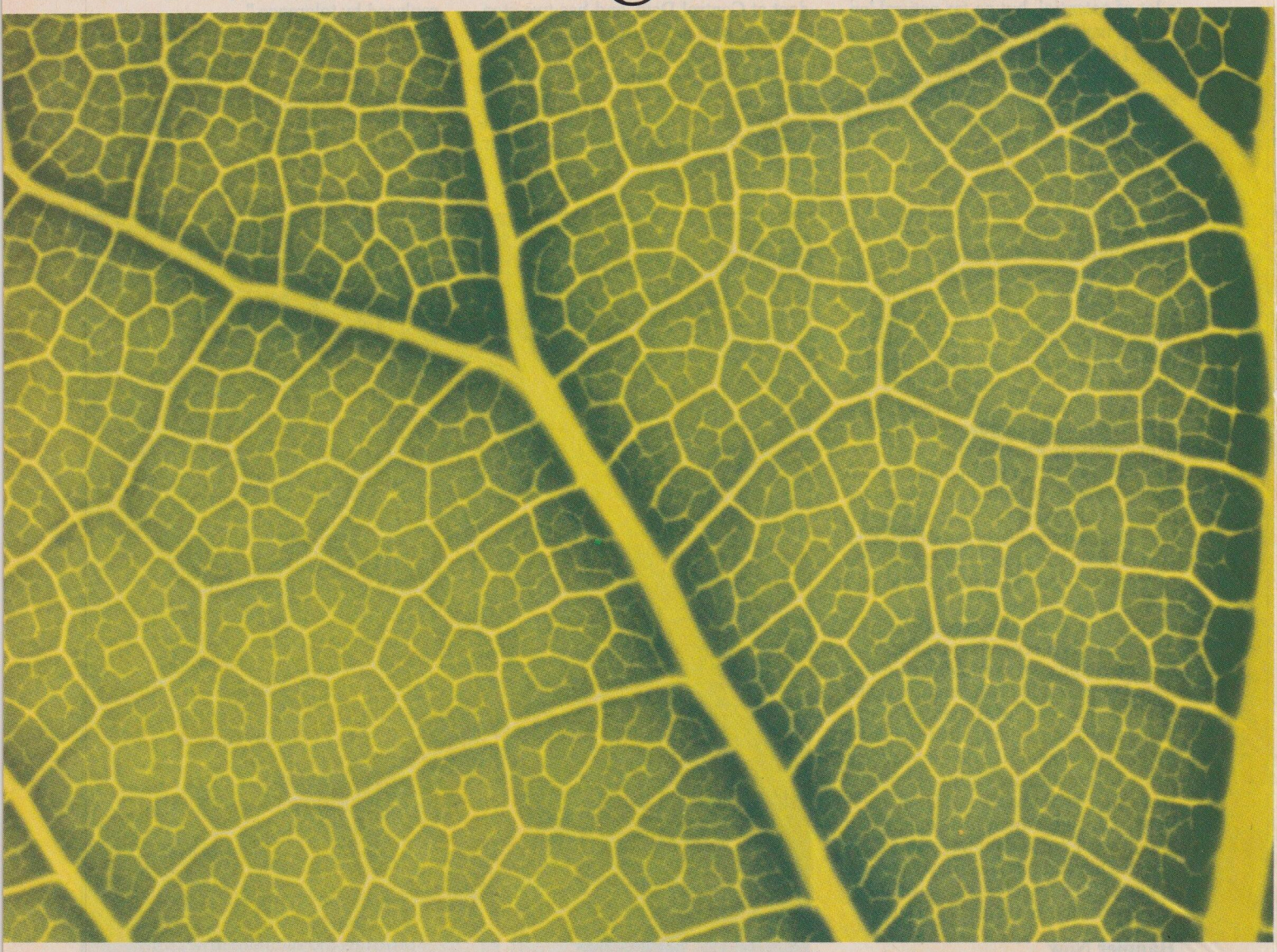

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MUST YOU CHOOSE BETWEEN X AND WINDOWS?

Or can Microsoft Windows and the X Window System peacefully coexist in an open system?

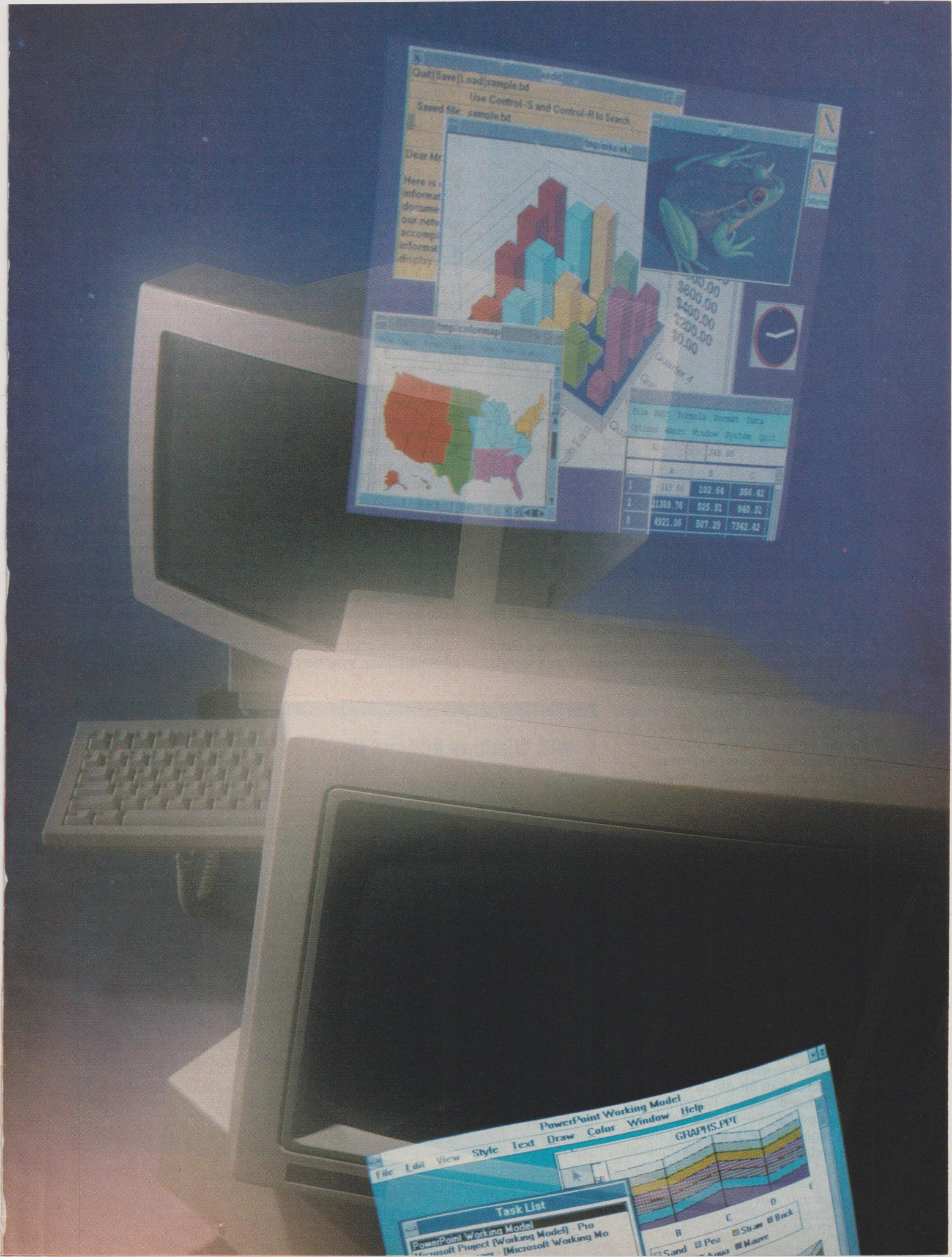
Are you balancing UNIX and the X Window System against the popularity and economy of the DOS-based Microsoft Windows? Are you finding that Windows has reached the critical mass necessary to make it worthy of consideration as a component of an open system? If your office uses X Windows and Microsoft Windows, you're eventually going to ask yourself "Which one should I standardize on?" Actually that's kind of like asking if you should buy a Ford or an airplane; the right question is "How do I know which platform is the best for my environment?"

Some applications are clearly suited to the X Window System whereas others are sure bets for Microsoft Windows. For instance, if you're buying a word processor for standalone use, you can get Microsoft Word for Windows for $250. FrameMaker, on the other hand, costs $2,500. Sure, FrameMaker can do more, but if you're just writing memos, who cares? Of course, if you're a professional documentation shop, and you've got 15 technical writers collaborating on a single proposal, FrameMaker on X is your best option because of its inherent multiuser support.

If you write commercial applications, you're worried about speed and reliability. If you're developing applications for in-house use, you're probably willing to trade some of the speed and reliability for the rapid application development provided by the Microsoft Windows environment. If you're a user, you're probably interested in the economics of the situation. Adding a net-

SANDRA FRANK

BY RICK FARRIS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Choosing Between Windows and X

The following chart shows which sorts of network applications are suited for X and which are better suited to Windows. The left side shows those applications that are graphics-intensive, such as graphics applications and desktop publishing. As you progress from left to right, the graphics requirement steadily decreases. For instance, a WYSIWYG word processor could use multiple fonts, and allow simple line drawings, while terminal emulation expects nothing more than an ordinary CRT could provide.

Generally speaking, Windows is best for in-house development of applications that match its "file server" model of network access, because of the availability of rapid application development tools. X must be used for the "compute-server" model of network access, as depicted at each end of the graph.

For commercial developers of the file server type of applications, the development platform should match the targeted market, and could be either Windows or X.

Typical Application	Desktop Publishing	WYSIWYG Word Processing	SQL Forms	Terminal Emulation
Commercial Applications	X	X or Windows	X or Windows	X
In-house Applications	X	Windows	Windows	X

Heavy graphics activity ← → Light graphics activity

work to the equation makes it even harder to solve, but will tilt the results in the direction of the X Window System.

If all other things are equal, you're probably concerned about cost. Windows applications are usually cheaper than X applications with some notable exceptions. While the Synchronize time manager (see review in March 1991 *UNIXWORLD*) costs $100 per user, it's not unusual to see X applications that cost three or four times more than their Windows equivalents.

The other obvious difference is the cost of the hardware and software needed to run Windows. A quick glance at a weekly computer newspaper in California shows that a name-brand 20-MHz 386SX with VGA, four megabytes of memory, and Microsoft Windows costs about $2,000. A 33-MHz 386, suitably configured for X Windows and including The Santa Cruz Operation Open Desktop, is closer to $5,000. You get a lot more with the UNIX setup, but if all of your applications will run under Windows, you can have two Windows workstations for the cost of one X setup.

What about X terminals? Marco Thompson, president of X terminal design firm Doctor Design, says "Eventually, I expect X terminals to cost as little as $300 more than an ASCII terminal." Craig Schmidt, also of Doctor Design elaborates: "By the second quarter of 1992, monochrome X terminals should have a retail price of about $1,000 and color units should be about $2,000," he says. "Street prices should be about $600 and $1,200 respectively." At that point, the economics of X may shift in the X direction, but for now, Windows is the cut-rate leader for the applications it can support.

As far as the applications themselves go, X/Motif has a slight ease-of-use lead with the "drag and drop" technology of IXI Ltd.'s X.desktop and other desktop managers (see the "Friendly Desktops" review in the September 1991 issue) but it won't take long for Windows to catch up.

CORPORATE DEVELOPMENT ISSUES

If you're developing applications there are several points to consider. First you have to decide if your application requires any of the special features that only X provides. If not, and you're developing an in-house application, you may be able to live with the inefficiencies of rapid application development (RAD) tools like Toolbook or Visual Basic for Windows. RAD is an inexpensive way to develop applications that don't have to compete for marketshare with other products. NewWave, an applications integrator from Hewlett-Packard, is another way to hook a series of applications together to create one "super" application.

X (with Motif or Open Look) and Microsoft Windows both provide graphical user interfaces (GUIs), but each has its own area of non-overlapping functionality. For instance, Windows has a whole raft of printer drivers built in. If you write your application to meet the Windows printer interface, Windows will convert the output to PostScript, HP-PCL, or whatever kind of printer you have. X/Motif has no native printer support and X applications are usually limited to PostScript and maybe one or two dot-matrix printers. Windows also has better font support–it can scale fonts, a facility that is only now available with X Version 11 Release 5.

For commercial applications that don't need network agility or multitasking, your best choice may be to develop in the C

Will Windows ACE-out UNIX?

Is the Advanced Computing Environment (ACE) the grand unification of the DOS and UNIX worlds? After all, ACE ensures that the same set of hardware will run both Windows NT (New Technology) and Open Desktop from The Santa Cruz Operation.

David Bernstein, director of strategic programs at SCO, sees no reason why the venture shouldn't be profitable for all parties concerned. "What people haven't realized yet," says Bernstein, "is that Motif and Windows NT are very similar user interfaces. What this means to developers is that one investment in training materials and documentation will now apply to all four environments supported under ACE." This is also a tremendous advantage for users–they can go from running Windows on a single-user platform to using full multiuser Open Desktop on RISC architecture.

While Bernstein paints a rosy picture for interoperability, Carl Stork, advanced development business manager for Microsoft Corp., sees things in a competitive light. "Windows NT is a more technically advanced operating system," says Stork. "It includes all the features necessary to compete with UNIX." Stork claims that Windows NT will be a full 32-bit operating system with support for symmetrical multiprocessing and hooks for network connections.

Microsoft expects to have Windows NT software development kits in the hands of developers before the end of the year, but SCO isn't standing still. "We're moving toward OSF [Open Software Foundation] standards," says Bernstein, "including the Distributed Computing Environment and Distributed Management Environment." Both are cornerstones of OSF's network computing model.

ACE provides both Microsoft and SCO with an upgrade path from Intel-based CISC architecture to a modern RISC-based machine. Expect to see fierce competition for that spot on your desktop.

–R.F.

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CIRCLE NO. 219 ON INQUIRY CARD

What's Wrong with X Windows?

With all its advantages, X seems like a natural choice for companies with programmers writing custom or in-house applications:

- X and UNIX have a solid and productive development environment and a wide variety of programmers' tools and utilities.
- The source code to most of the GUI environment is available at little or no cost, simplifying occasional necessary low-level fixes or the understanding of the underlying libraries.
- X clients can run on a wide variety of systems, helping to ensure that your product will meet performance specifications on at least some currently available hardware.
- Last, and most importantly, there are X servers available for practically any hardware that has bitmap display capability. Whether they have PCs, Apple Macintoshes, or even ancient Sun Microsystems or Apollo workstations, your users probably already have the hardware they need to run X applications on their desks.

But X is not without its warts. Developers who are comfortable in the Macintosh or Microsoft Windows environments will curse the primitive font-handling design of X, which makes distributing a complete set of fonts a necessity for anyone producing a WYSIWYG application. X also lacks many of the primitives found in the Microsoft Windows and Mac toolkits. For example, the X protocol does not support the ability to draw rounded rectangles, stroke fonts, justify text, or scale text or bitmaps.

Although X Version 11 Release 5 (X11R5) will address some of X's font-handling shortcomings, many problems remain and X11R5 won't be available from most commercial vendors until early- to mid-1992. X developers also have to write their own hardcopy output systems because the X Consortium has not specified the interface calls necessary to support printers and plotters, let alone provided actual servers. Developing for X is also relatively expensive as the hardware, operating systems, compilers, and GUI building tools all cost far more for the UNIX environment than they do for the Macintosh or Microsoft Windows.

X also lacks the polished rapid application development (RAD) systems–such as HyperCard, ToolBook, Visual Basic, and

Object Vision–that are becoming very popular in the Mac and Microsoft Windows worlds. Not to be confused with the many GUI builders for X, which require using the C language for most of an application's code, RAD systems enable developers and users to create powerful applications without using a conventional programming language–potentially shaving months off an application's development time.

The market for X tools is much smaller than the comparable Mac or Windows markets, and it is difficult to produce these highly interactive tools using the relatively inflexible toolkits commonly used to develop other X applications. For example, enhancing widgets, such as those found in the Motif widget set, so that they could draw to off-screen memory or allow themselves to be dragged or sized dynamically would be a formidable task. These factors suggest that it will be some time before tools like these become available for X.

The X Window System is also years behind the Windows and Macintosh worlds in the area of interapplication communication. While dynamic data exchange, HP's NewWave, and the interapplication communication features built into Apple's System 7.0 offer the potential to build new applications by merely stringing together existing applications, the X environment still lacks a specification for such basic features as cut/copy/paste functions for vector-based objects or text with attributes.

It is also an annoyance, albeit not a major headache, for most custom application developers that instead of the single style-guide one has to choose from in the PC or Mac worlds, there are competing GUIs in the X world. Although most industry observers feel that Motif is destined to command the lion's share of the X market, there are places where Open Look is deeply entrenched. What if you want to sell your product to users of both "religions"? Should you use a portability toolkit such as XVT Software's XVT or AT&T's OI Toolkit?

While the constraints on custom application projects vary widely, there is one universal truth in GUI programming: developing with the normal vendor-supplied toolkit–whether it be the Mac Programmer's Workbench, the Windows Software Development Kit, or the Motif widget set–is a difficult and time-consuming undertaking. If time is one of your constraints, as it usually is, it would be a good idea to investigate using a RAD system, even though it may mean sacrificing performance, hardware flexibility, and maybe even the X Window System.

–Scott Raney

Scott Raney has designed and coded several GUI-based applications.

language for Windows. The extra performance available from a hand-coded application will bring added market value.

Network Awareness

Windows doesn't have any special network support. In order to run a program on another computer you must first start a terminal emulator and run the program in the terminal window. The remote program can't do things like open new windows, resize windows, change fonts, do graphics, or anything else beyond the grasp of a typical ASCII terminal. So, for programs that can take advantage of multiple windows or need to display graphics across the network, like a desktop publisher running on a central computer, Windows isn't a good choice.

X, on the other hand, is inherently a network product. If your product is written for X, it can execute anywhere on a network and use your workstation for its display. X products can take advantage of fast floating-point computers to do calculations. Windows has no concept of compute servers.

If you use a PC and only need occasional access to computers running X Windows, or vice versa, you don't have to choose between X and Windows. X server products let remote X clients open windows in your Windows environment (See "Serving Up X from a PC" review on page 97). These products may be just what you need if you have a primarily UNIX network with a few DOS machines running Windows. Likewise, the UNIX-based DOS emulators will run Windows. In both cases performance suffers, but it's acceptable for light or infrequent use.

X Windows and Microsoft Windows are perfectly capable of peaceful coexistence. The Motif and Windows GUIs are similar enough that users can readily move from one platform to another without retraining. The important thing to remember is that the question of "Windows vs. X Windows" isn't an either/or matter. Each has its uses. ■

Editor-at-Large Rick Farris consults with companies in the San Diego, Calif., area. He can be reached on the Internet as **rickf@uworld.com**.

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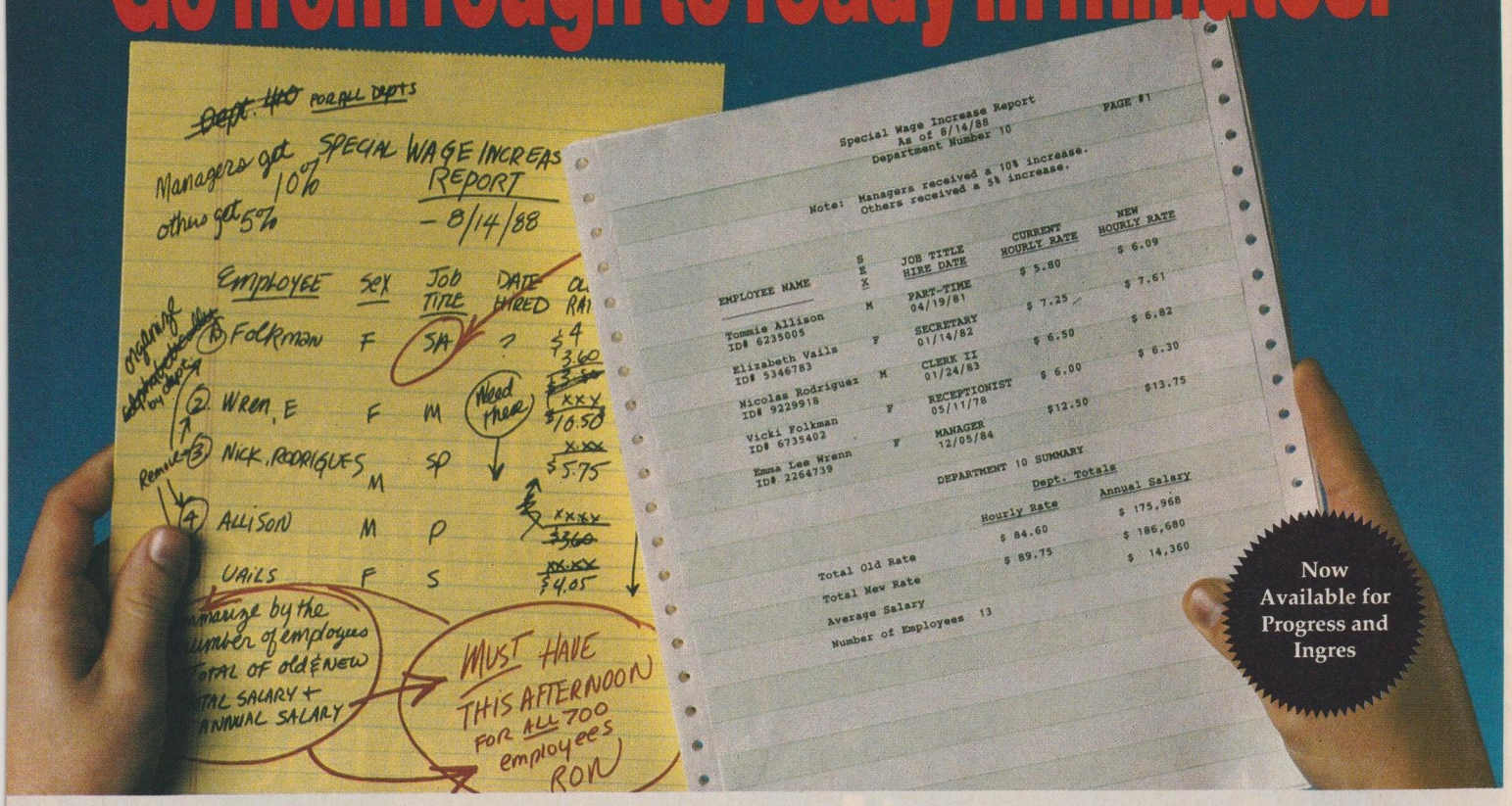

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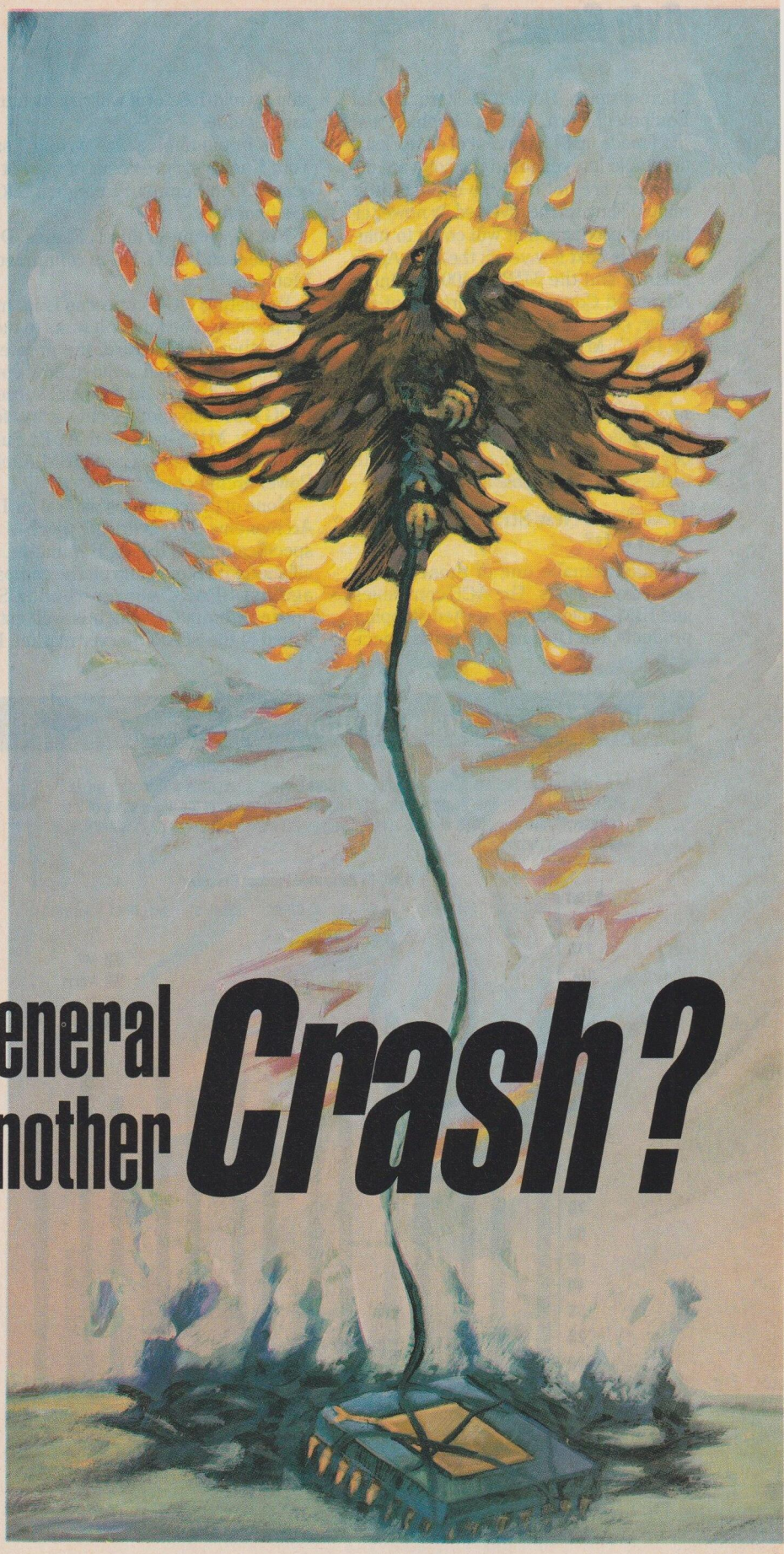
CIRCLE NO. 129 ON INQUIRY CARD

Is Data General Headed for Another Crash?

Rising from the ashes, Data General has returned to profitability with an open systems strategy, but its ties to the Motorola 88000 chip could bring it to the ground again

by Gary Andrew Poole



KEVIN A. SHORT

Today, most industry watchers sing Data General's praises. While other minicomputer companies struggle to survive, Data General has become not just a major financial success, but an open systems one. Its outlook hasn't always been so positive. In the late 1980s DG moved to UNIX in desperation because its proprietary minicomputer strategy wasn't reaping revenues. Its move has taken the company from financial morass toward profitability in difficult economic times.

But DG has a problem. When DG designed its RISC Aviion line, it chose the Motorola 88000 as its microprocessor. DG is the only major workstation vendor currently using the Motorola RISC chip. DG's choice of chips was a sound technical decision, but unpredictable market forces have left DG isolated.

Unfortunately, software developers don't have as much impetus to write best-selling applications for DG's 88000-based machines, because DG doesn't ship as many machines as the leading workstation vendors. Workstations made by Sun

Microsystems, Hewlett-Packard, Digital Equipment Corp., Silicon Graphics, and IBM made up 81.9 percent of all workstations sold last year. And the software developers are not likely to change their minds. They will be diverted by newer alliances' products that will come to market in the next few years: the IBM-Apple alliance and the MIPS R4000-oriented Advanced Computing Environment initiative, consisting of market powerhouses DEC, Microsoft, The Santa Cruz Operation, and Compaq Computer.

"DG's long-term survival isn't positive," says Michael Goulde, an analyst with the *Open Systems Advisor.* "If DG wants to last beyond five years, it's going to have to make some remarkable moves."

Time For a New Strategy, But What is It?

DG has to make one of those moves soon, say analysts. The ACE companies and IBM-Apple haven't started shipping products, but DG needs to make a decision by mid-1992 or it will risk its future, says Goulde.

"Its initial choice was wrong," says Tom Kucharvy, president of market research firm Summit Strategies. "DG is in a quandary."

Not so, counters Ron L. Skates, DG's president and CEO. DG is committed to Motorola.

Escalating DG's concerns is its market position. The longer it waits to move to another architecture, the greater it risks its future–but a move now could jeopardize its present financial success. If DG moves to another chip, it has four choices: MIPS-oriented ACE; Sun's SPARC; HP's PA-RISC; and IBM-Apple's Power architecture.

None of the choices is natural for DG. Arch-enemy DEC is driving much of the specifications in the ACE initiative. An alliance with Sun would pit the company against SPARC server vendor Solbourne Computer, which is well established in the SPARC server market. DG and HP compete directly so the PA-RISC is unlikely. And while it could follow in the footsteps of Apple, a company that had the the identical problem with Motorola until it announced its alliance with IBM, the IBM Power architecture won't be ready for at least a year.

In the short-term, DG executives say they're satisfied with the 88000 chip. DG executives are playing the situation as a "competitive advantage." Competing chips don't hold any allure for DG and "ACE just further fragments the desktop," says Steve Baxter, DG's vice president of corporate communications.

"Our strategy is simple," says DG's Skates. "Customers want the cheapest machine possible. We're providing those products today."

Although DG publicly tries to brush the Motorola issue aside, it is faced with some difficult choices. As a relatively small company, DG doesn't want to be perceived as an iconoclast. It must continue to generate large revenues. It can't align itself with IBM and Sun for competitive reasons, and it can't wait around while the ACE initiative struggles to move forward. Its window of opportunity is narrow and closing.

"It's difficult and expensive for DG to change its position," says Carolyn Griffin, an analyst with market research firm International Data Corp. She believes that another strategic shift by DG after its recent product moves could alienate customers.

Doing Well in a Soft Economy

While DG has had more than its share of ups and downs, the situation is currently up. In the late 1980s, the once-successful DG watched its profits fall as a result of a slide in the minicomputer market. Although its proprietary line–the Eclipse/MV line of minicomputers–was generating high margins, sales were fading. Customers were more interested in less expensive industry-standard computers. DG reacted with an open systems strategy.

The Westboro, Mass.-based company began pushing its Aviion line of UNIX-based servers and workstations. DG also cut programs and slashed its workforce to reduce costs. As a result of cost-cutting and its high-growth Aviion line, DG has reported three consecutive profitable quarters so far this year.

DG, historically looked upon by investors as a safe, almost stodgy company, has made moves in the last three years that were almost Machiavellian. It slashed its workforce, sold facilities, and rapidly introduced a line of open systems-based prod-

Data General Pushes Aviion

Analysts predict that an increasing amount of Data General's revenues will come from its RISC-based Aviion line. Its proprietary MV line continues to garner the lion's share of the company's revenue, but its share is diminishing as DG makes a stronger push with its UNIX-based machines.

SOURCE: Salomon Brothers

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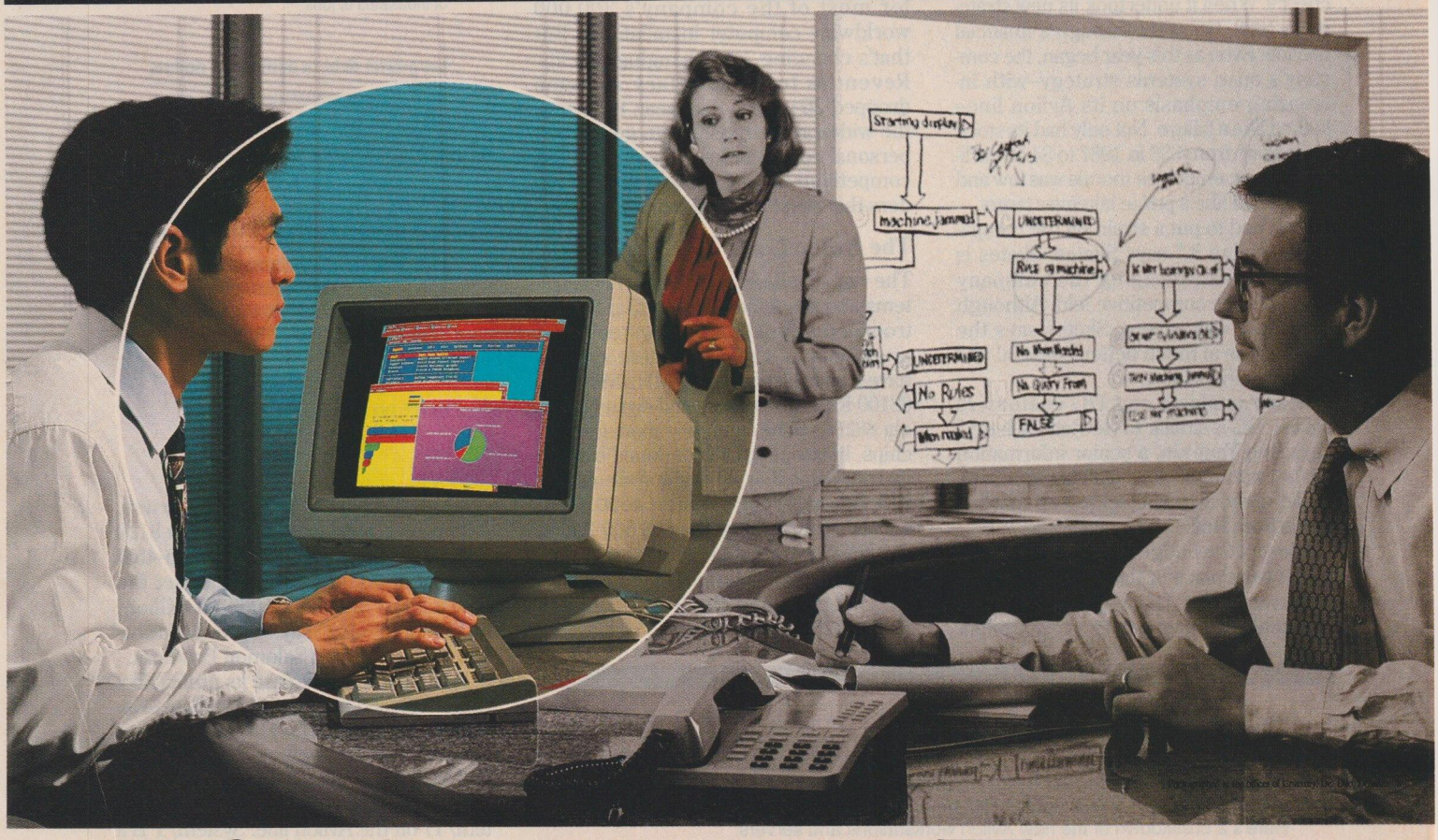

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ucts. These moves reduced the company's long-term debt from $240.7 million in 1986 to $56.9 million in 1990.

"I'm looking at companies that are going down," says Barry Bosak, an analyst with Smith Barney, Harris Upham, and Co. "I'm very bullish on Data General. It's holding its own."

A few years back, analysts weren't so cheery. When it undertook its new strategy in 1988, DG went through a financial decline. Even as this year began, the company's open systems strategy–with increasing emphasis on its Aviion line–looked like a failure. Not only had its stock price gone from $38 in 1987 to $4.50 earlier this year, employee morale was low and DG looked like a prime takeover target.

"We had to put a strain on the company to realign it," says Skates. Skates is credited with bringing the company back into the competitive fold. Although the strain was severe, Skates says the company is in much better financial and strategic shape now.

Many analysts and DG customers agree. "DG is similar to Hewlett-Packard," says Bob Vautrain, a senior information analyst with InfoCorp. "It bit the standards bullet early, now it's picking up market-share from Bull, Prime, and Wang."

Most of the budget and personnel cutbacks took place in the proprietary MV divisions, but DG representatives staunchly call themselves a two-product company: Aviion *and* MV. They don't want to alienate their base of proprietary customers. In fact, DG announced several new products for its Eclipse/MV Family of 32-bit systems in July. DG spokespeople say more new products will be released in coming months. "MV is forever," says a DG spokesperson.

MV is "forever" because it accounts for most of the company's 300,000 worldwide computer installations. But that's changing, and changing quickly. Revenues for proprietary systems dropped 25 percent last year, reflecting the widespread transition to networked personal computers and the intensified competition among minicomputer vendors that resulted from that transition.

The Aviion Line

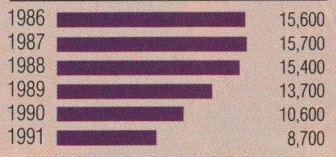
The real emphasis at DG is on open systems and the Aviion line. In March it introduced a group of new systems that produce up to 117 mips. These systems have a board with four 25-MHz Motorola 88100 RISC processors and eight Motorola 88204 cache/memory management chips. In late July, DG continued beefing up the Aviion line with new systems: the $19,995 mid-range Aviion 4600 RISC server with 39 mips; the $13,500 Aviion 530 RISC workstation with up to 78 mips; the $9,995 Aviion 4100 entry-level RISC server; and the $43,500 Aviion 5225/6225 RISC server.

Slashing Debt... and Jobs

Data General has cut millions of dollars off of its long-term debt, which has helped the company reach a degree of profitability. However, this profit has come at the expense of thousands of jobs.

Long-term debt in millions of dollars

Data General employees worldwide



SOURCE: Data General

"Over the next two to three quarters, Aviion revenues could move from $120 million to more than $200 million–that increment could more than offset the now-modest decline [$50 to 60 million] in MV revenues," says Steve Milunovich, an analyst with Salomon Brothers.

If DG wants to increase its profitability with the Aviion line, it must continue to introduce new products. The company has signed a licensing agreement with UNIX System Laboratories (USL) to offer Tuxedo System Transaction Manager (System/T) on the Aviion line. System/T is a software product that provides a framework for building online transaction processing (OLTP) applications on UNIX System V operating systems.

The OLTP agreement will help DG in the commercial marketplace because of the growing interest in UNIX OLTP. DG's strategy has been to avoid head-on competition with Sun, DEC, and IBM in the scientific workstation area. Instead, DG concentrates on the commercial sector and U.S. government contracts where it has won substantial bids with the Environmental Protection Agency and the Department of the Interior. In 1990 the department's geological survey water resources division agreed to buy 6,000 Aviion computer systems over four years.

"Our challenge here is to keep our technology edge," says Allan Jennings, vice president of Aviion development. "We're still a technically oriented culture."

continued

The Aviion Workstation Line

Data General introduced three new machines this summer. The systems have single- and dual-processor configurations supported by DG's UNIX, DG/UX 5.4. Here's a breakdown of the new Aviion workstations and servers:

Aviion 4600 RISC server A $19,995 mid-range machine with 32 megabytes of memory and a 332-megabyte 5 1/4-inch SCSI disk. It uses the 33-MHz Motorola 88100 processor and delivers 39 mips. The machine is targeted at commercial markets that run database applications, including retail distribution, manufacturing, and health care.

Aviion 530 workstation A $13,500 system with 16 megabytes of ECC memory and 32 kilobytes of internal cache. The 530 is binarily compatible with the rest of the Aviion line and provides CPU performance of up to 78 mips. Users can add various options such as eight- or 24-bit graphics for enhanced graphics.

Aviion 5225/6225 A $43,500 server with 64 megabytes of memory and a one-gigabyte SCSI disk. These servers provide an AIM III maximum user load of 414 users and are targeted for large database applications. Data General says customers of these systems will have a migration path to the quad-processor Aviion 7000/8000 through a CPU board upgrade.

The 117-mips Aviion 7000/8000 series was announced in March amidst a lot of fanfare from DG. Some analysts say the Aviion 7000/8000 has good technology, but isn't good for high-volume transaction processing. A recent report by the Aberdeen Group states: "The Aviion multiprocessors have all the right technology on paper, but the 100 TPC-B transactions per second (tps) on a 117-mips quad-processor machine indicate either mips inflation or unspecified bottlenecks. We would expect around three tps per mips. The Aviion multiprocessor seems better suited today to timesharing than high-volume transaction processing."

–G.A.P.

Data General

Data General made its early fame as a technology-oriented company. In the 1970s and early 1980s it had technical success which turned into financial riches with its MV line of minicomputers, the designing of which was described in *The Soul of a New Machine,* a Pulitzer prize winning book by Tracy Kidder.

DG continued to upgrade and emphasize this line, but its narrow focus MV strategy took resources away from other lines. In the early-1980s, the PC market was burgeoning into a large market. The company underestimated the PC market and lost it. When UNIX workstations became popular in the mid-1980s,

Data General could buck the trend of Old Guard minicomputer vendors going bust

Data General continued to focus on the MV line. Its MV line garnered a faithful following of users who didn't want to learn UNIX, but DG missed the opportunity to capitalize on the larger growth workstation and server market.

Moving into the workstation and server market with its Aviion line is paying off now. Revenue per employee will be roughly $140,000, says Milunovich of Salomon Brothers. He says that figure is 30 percent higher than DEC's.

Data General has gone through an enormous swing from Wall Street darling to near bust to financial renaissance. To grow it must keep its technologic edge and introduce new products. If the company stays focused it could buck the trend of Old Guard minicomputer companies going bust. DG has cut expenses, pushed its Aviion line, and generated three quarters of profits. In the short term, its profits look positive, but it still must resolve the chip question. If it doesn't set a long-term strategic path for its Aviion line, software developers, and its installed base, DG will face a future as harried as its past. ■

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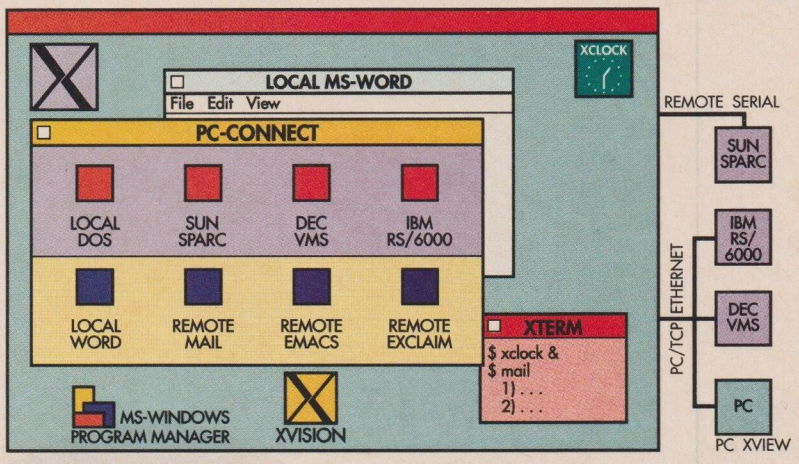

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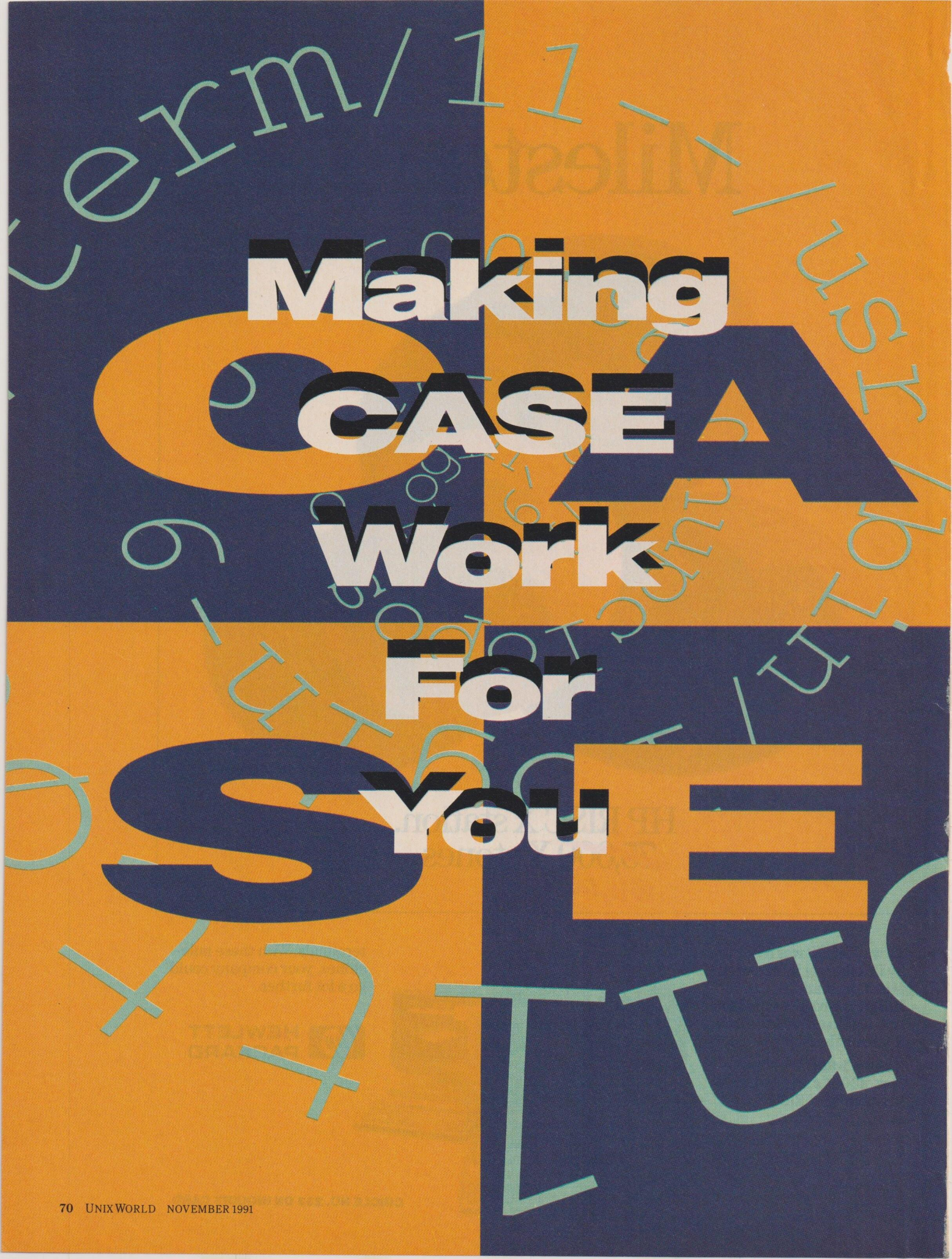
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OU NEED TIME, MONEY, AND EFFORT TO USE CASE TOOLS AT MAXIMUM EFFICIENCY. THE RESULTS ARE WORTH IT: FASTER SOFTWARE DEVELOPMENT AND INCREASED PRODUCTIVITY

IT'S NO SECRET THAT BIG SOFTware systems are hard to build and very expensive to maintain. The larger a software project is, the more difficult it is to complete. Many independent software vendors seem to have given up hope of getting major products that meet their specifications out the door on time and bug-free. Corporate developers have the same problem: big software projects simply get out of control.

Many companies have turned to computer-aided software engineering to solve their productivity problems. CASE uses computers as tools to do software engineering. It's a broad field that has been applied to everything from compilers and debuggers to fully integrated super-environments that automate every stage of the software development process from initial analysis through the maintenance cycle and entire life of the resulting software.

All versions of CASE tools have

BY FRANK HAYES

one thing in common: they're tools, not self-contained solutions. They all depend on programmers' and managers' software development skills. Without these skills and a solid understanding of how to manage the development process and design good software, CASE is bound to fail. Bill Baker, director of corporate development for James Martin Associates, says a common user complaint about CASE is that "the salesperson promised me the methodology was in the tool." CASE tools don't design software or manage software projects. At best they can only help good programmers and managers do their jobs.

In fact, one organization that has studied the problem says if you haven't first mastered the skills you need, CASE simply can't work. The Software Engineering Institute at Carnegie-Mellon University surveyed 200 software development organizations and found that most technical developers–and *all* MIS shops–were still in a state too chaotic to put CASE technology to effective use. This leaves little wonder why CASE software often becomes shelfware

Why does CASE have such a bad reputation? CASE vendor Nick Copping, president of Atherton Technology, refers to the bad reputation as a "CASE winter." "The ones who aren't succeeding scrimped on training," suggests Lou Mazzucchelli, vice president and chief technical officer of another CASE vendor, Cadre Technologies.

Or maybe they were in too much of a hurry, says Dr. Harlan Hullinger, director of product line management at NCR: "CASE is just the opposite of an immediate panacea."

A growing number of software experts thinks the missing link is software engineering: applying the rigor of engineering to software development. During the last 20 years, software gurus including James Martin and Clive Finkelstein have tried to find ways to make large software projects as reliable and sturdy as large construction projects.

Saving Money with CASE

The list of companies that *have* made UNIX CASE work is growing. McDonnell Aircraft Company, a division of McDonnell Douglas, used Cadre's Teamwork CASE system while working on software for an Ada-based heads-up instrument display. The display, designed for military aircraft, flashes instrument readings to a pilot's helmet, so it's not necessary for the pilot to look down at the actual instruments.

The results of the completed project are a CASE user's dream. McDonnell Douglas calculates that use of CASE tools resulted in a 15 percent reduction in the software-development effort. Because more bugs and other problems were detected early in the process, software testing and integration time were cut by 50 percent. Best of all, the tools allowed designers to add 220 separate enhancements to the finished product without lengthening the schedule or increasing the budget.

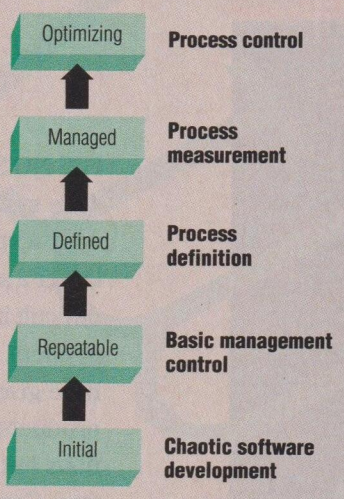
McDonnell Douglas isn't alone. CASE vendors including Cadre and Hewlett-Packard report a string of practical projects that have used UNIX-based CASE tools to meet deadlines and budgets, and greatly reduce the number of bugs and time required for testing. Siemens Stromberg-Carlson developed a telephone switch with less than one defect per 1,000 lines of code. CAI Recon Optical, which makes reconnaissance and sighting systems for the military,

Are You Ready for CASE?

At the Software Engineering Institute at Carnegie-Mellon University, researcher Watts Humphrey has developed a "process maturity model" to gauge the effectiveness of an organization's software development techniques. Humphrey's model describes five phases a software developer must go through to be able to adopt software engineering techniques.

According to the model, in the initial phase, an organization uses a "chaotic" approach to software development and is often in a constant state of crisis. At level two, the "repeatable" phase, the organization uses basic management controls to make sure each project is well-defined, won't constantly change during development, and will be monitored for quality. At the third, "defined" level, the organization has established a clear definition of its development process in the form of a written plan that can apply to every project. At the "managed" phase, level four, the organization begins to measure its development performance. And at level five, the "optimizing" phase, the organization has finally gained systematic control of the development process and is in a position to continually evolve.

The five levels of process maturity.



SOURCE: Software Engineering Institute

Every organization starts at the first level and must proceed step-by-step through each level to reach the fifth level. CASE tools aren't likely to do much good until basic management controls are in place to make the process less chaotic. However, Humphrey says that when the Software Engineering Institute surveyed development shops, it found that 75 to 85 percent were still at level one–and *all* of the commercial MIS shops studied were at the first level. With this in mind, it's no surprise most programming shops haven't found much success with CASE–they simply aren't ready for it.

The maturity model may look intimidating to some programmers: all that control and statistics-gathering can sound like an attempt to turn creative programmers into drones. But Humphrey, who managed programmers for more than two decades, discourages managers from using statistics to measure programmer performance. The goal is to control the process, not the programmers. The point of Humphrey's five levels is to eliminate poor planning, constant changes in direction, and wasted effort. That way, good programmers can do what they do best because they're no longer constantly fixing problems created by poor programmers–or poor management.

–F.H.

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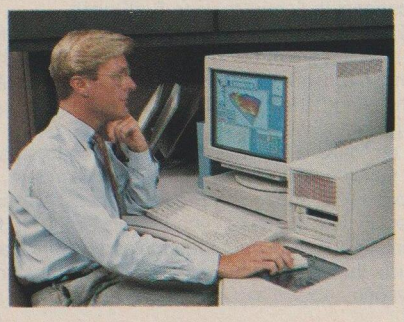

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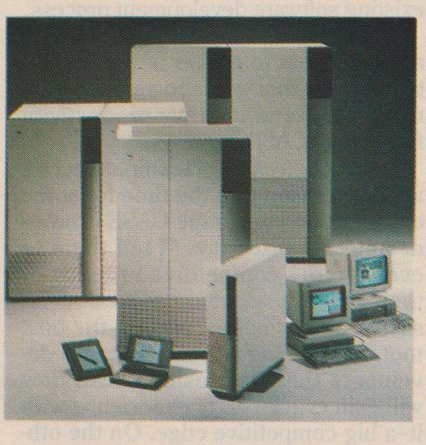

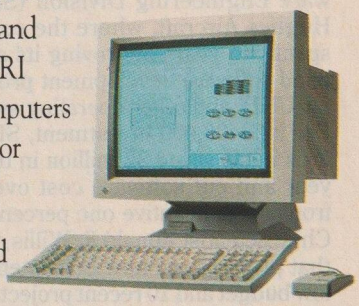

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started a project with limited CASE experience, but still came in on schedule and under budget. AT&T Network Systems, in working on a 911 call-routing system, detected 150 percent more defects than usual during the initial analysis stage alone. HP's own printed circuit board division shifted to CASE to develop and maintain 150,000 lines of C++ applications and estimates a 30 percent increase in productivity. The list is striking, not only because each project was successful, but because each resulted in *measurable* improvements in the development process.

An even more impressive measure of CASE success comes from the Software Engineering Division (SED) of Hughes Aircraft, where the company spent two years improving its already good software development processes for UNIX and other operating systems. For its $400,000 investment, SED figures it has saved $2 million in the first year and cut software cost overruns from six to negative one percent. SED Chief Scientist Ronald R. Willis reports that projects are now consistently below budget and 10 recent projects came in 10 to 38 percent below their proposed costs. In addition, programmer morale is up, crises are fewer, overtime work hours are down, and personnel turnover among the division's software professionals is below 10 percent.

The Secret of CASE Success

What sets these CASE success stories apart? Companies, vendors, and consultants agree that successfully utilizing CASE technology requires a major commitment of time, money, and effort. A CASE tool isn't a magic bullet that will instantly and invisibly transform software development. "People tend to want easy solutions," says Gene Forte, executive editor of the newsletter *CASE Outlook*. "They want to ask, 'Can I buy a CASE tool without doing anything else and get these improvements?'"

That's not the way to CASE success. Programmers and managers must learn what the tools do, and what other procedures and organizational changes are necessary to make better software. Even small-scale applications of CASE, such as Sabre C's integrated editor-compiler-debugger environment, require programmers to rethink the techniques they currently use to create code.

Training is a key area that is often short-changed because managers underestimate how much of a training investment CASE requires. "The rule of thumb is, whatever the budget is for tools, you need three to five times that for the training budget," says David Sharon, president of the consulting firm CASE Associates. "I ask that question early in the process. If they haven't budgeted enough for training, I tell them, 'You're not ready for CASE.'"

To help guarantee CASE success, many CASE vendors offer training and consulting to complement their CASE software. Cadre, HP, Texas Instruments, IDE, and other companies have specific programs tailored to their CASE products. In addition, consulting companies such as James Martin Associates and Andersen Consulting have their own CASE tools that align with their approaches to software engineering.

The price tag for the tools and the necessary training is often high. To get users past the "sticker shock," some CASE vendors have special package deals for pilot projects. To encourage new users of its Software Through Pictures, IDE offers $150,000 worth of software, as well as training and consulting services, for $100,000–a substantial discount.

Worth the High Price Tag?

Once you've paid the bill for your CASE system, when will you start to see the return on your investment? Some parts can pay off quickly. Sharon of CASE Associates says some users see modest, but measurable, gains in programmer productivity and software quality in as few as three months, just through assessment and improvement of their existing software development process.

It takes more time for programmers and managers to master new tools and techniques that will shorten development times and improve productivity from using CASE, however.

CASE Outlook's Forte thinks there's another reason that the time for some organizations to pursue CASE is now–despite the price tag. "I tell them to evaluate the competitive urgency of their ability to develop software," he says. The key is "not picking the best tool, but picking *a* tool." Software developers that start using CASE now will gain crucial early experience with it–a big competitive edge. On the other hand, Forte believes that those that "fall out of the technology curve" will never be able to catch up.

In short, CASE is an opportunity with costs in tools, time, and commitment. However, the result of an investment in CASE can be faster software development, which will save you money right now–and better software quality, which will save you money in the future. ■

UNIX CASE Tool Integration

The current issue in the area of UNIX computer-aided software engineering (CASE) is integration: tools that work together to form an integrated environment, rather than as individual CASE tools. Sabre offers an integrated C compiler, editor, and debugger. This way, in the event of a compiler or debugger error, the programmer can immediately return to the point in the source code that generated the error. Sabre's integration goes even further: It also can connect to IDE's Software Through Pictures and FrameMaker or Interleaf to automatically generate review documentation and design specifications.

More elaborate CASE environments can integrate even more CASE tools. However, there's a trade-off between openness and effectiveness. Texas Instruments sells a completely integrated CASE system, but it uses only TI tools. And Atherton Technology's Software BackPlane includes a limited number of third-party tools. But Hewlett-Packard's SoftBench expands the choices still further by allowing users and vendors to connect their own tools to SoftBench.

Still, as ProCASE Vice President of Research and Technology Planning Brian Gill-Price points out, the integration of the tools is limited by the fact that few of them are really intended to work together. Vendors must specifically target other products to work with, "gluing" them together one at a time. The question, Gill-Price says, is "How much gluing do we do?"

The answer may be "quite a lot" until competing vendors settle on standards. Atherton is currently pushing ATIS, A Tool Integration Standard, codeveloped with Digital Equipment Corp. HP is supporting BMS, Broadcast Message Server, developed at Brown University. And European vendors prefer PCTE, the Portable Common Tool Environment. Fortunately, both Atherton and HP have already announced they'll develop products that interoperate with PCTE. Until they do, adding tools to integrated CASE environments will have to happen one piece at a time.

–F.H.

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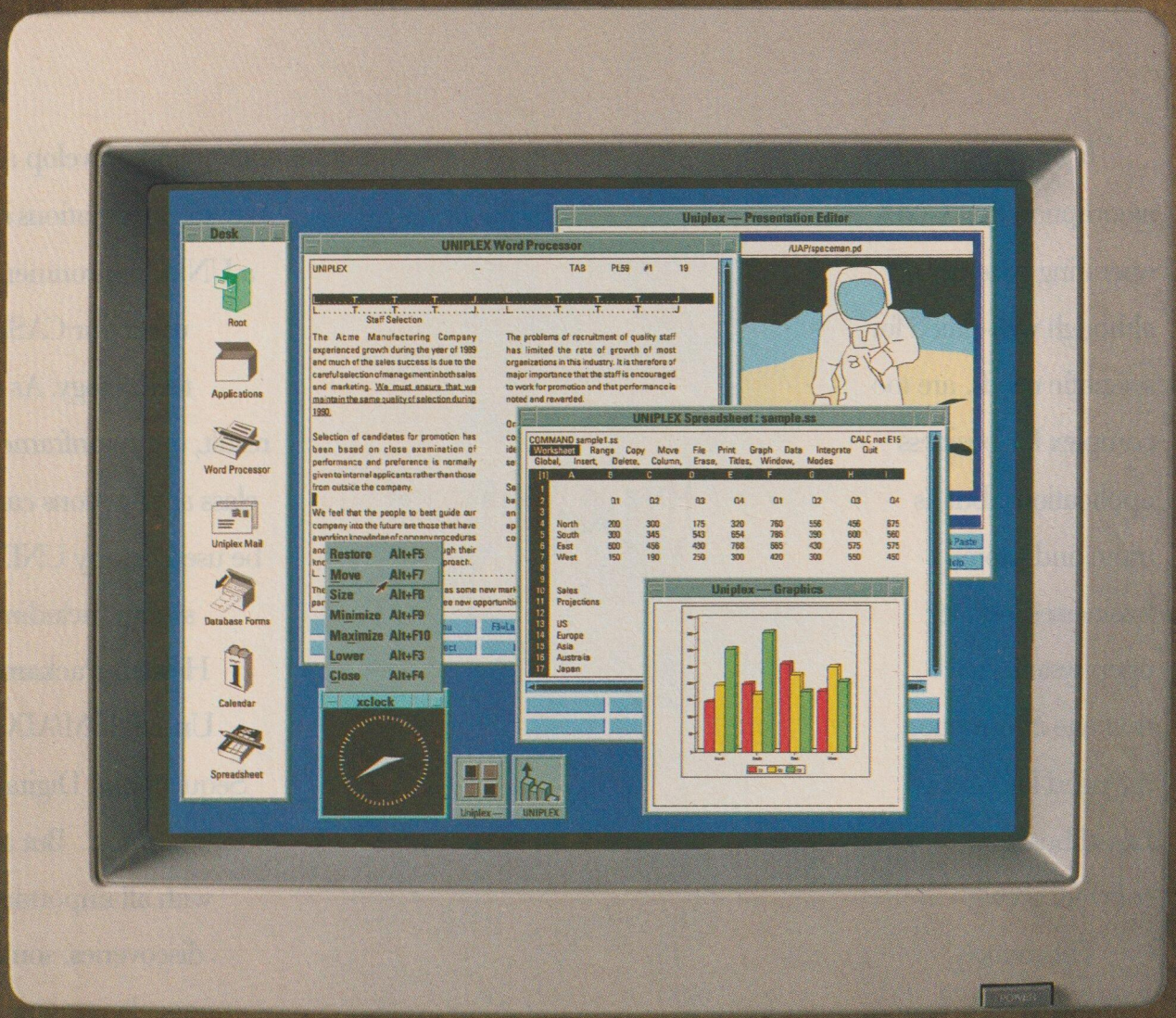

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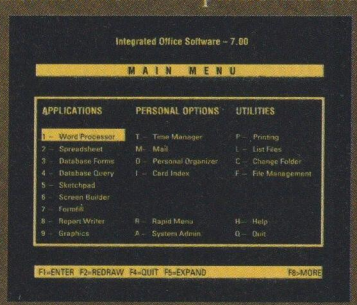

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than UNIX, don't ya know? You can reach people on MCI and Compuserve if you have the right connections

JIM HEIMANN

Beyond UNIX

By **Art Campbell**

YOU'RE PROUD OF YOURSELF. You've learned how to get around in the UNIX mail program, UUCP. Perhaps you've also learned how to navigate the Internet, the non-commercial network for educational and research institutions.

But e-mail is bigger than UNIX, and now you have a new challenge–reaching colleagues who have addresses on non-UNIX online commercial services such as Compuserve and Genie, or others like BIX, the electronic bulletin board and information service operated by *UNIXWORLD*'s sister publication, *Byte*.

Thanks to e-mail's usefulness in business and computer users' personal lives, making connections keeps getting easier. You still need to know where and what your colleague's address is, but once you get the address, if their service is hooked up to UNIX networks, you can connect.

UNIXWORLD has discussed global networks and wide-area networks in earlier stories on UUNET and the Internet (see February and September 1991 issues), but now you're ready to move outside UNIX. The easiest communication paths are found in the big electronic communications services like Compuserve and MCI Mail. Like the Internet, many smaller services and private bulletin boards tie into these larger services somewhere along the line.

E-mail to and from BIX subscribers travels over an Internet connection. Compuserve users can send e-mail to any computer that can reach Internet, send e-mail telegrams over a Western

Union tie-in, and route printed copies of their messages to people's mailboxes. Subscribers to The Well, a tiny service spun off from the Whole Earth Access Catalog, can reach Bitnet, UUNET, MCI Mail, and Compuserve users.

Your messages can be sent across several gateways. Compuserve doesn't tie directly into UUNET, but has a gateway to Internet and Internet does tie into UUNET. So a Compuserve subscriber can send a message to a UUNET subscriber via Internet, and the UUNET subscriber can reply the same way. Because each user has a unique identification number or user name on each system, the connections are automatic and transparent to the sender and receiver.

There are two ways to communicate across the networks. The easiest and least expensive, but more limited, approach is

E-mail Services and Features

BIX

Contact Number: 800-227-2983 or 603-924-7681

To send e-mail from a UNIX system, type: *not yet available*
No. subscribers: 30,000
Rates: $39.00 for three months, plus communications surcharges
Compose off-line and upload ASCII files?: Yes
Download mail?: Yes
Binary file transfer?: Yes
Gateways and delivery options: Internet link to be installed by end of 1991.
Other Features: Numerous software and hardware forums. Generally contains material at a higher technical level than most other services.
Terminals supported: Most character-based. A proprietary interface is available, but is not required.

Compuserve

Contact Number: 800-848-8990

To send e-mail from a UNIX system, type: *user#*`@compuserve.com`
No. subscribers: more than 760,000
Rates: Vary with the baud rate used. Hourly, from $6.00 up.
Compose off-line and upload ASCII files?: Yes
Download mail?: Yes
Binary file transfer?: Yes
Gateways and delivery options: Internet, UUNET, Bitnet, MCI Mail, Telex, and hard copy delivery by fax or postal service.
Other Features: Full-featured character-based system includes hardware and software forums, vendor product support forums, many interest groups. Gateways to more than 700 commercial databases containing business information, full text of newspaper and magazine articles, etc. E-mail service includes delivery receipts, "Congressgrams," seasonal greeting messages.
Terminals supported: Default is VT100, although most character-based are supported. DOS and Macintosh front ends available, but not required.

Genie

Contact Number: 800-638-9636

To send e-mail from a UNIX system, type: *not available*
No. subscribers: more than 250,000
Rates: From $4.95 per month for evening hours to $18.00 per hour during "prime time" business hours.
Compose off-line and upload ASCII files?: Yes
Download mail?: Yes
Binary file transfer?: Yes
Gateways and delivery options: None outside the network right now. Internet connection is planned before the end of 1991.
Other Features: Full-featured character-based service. Numerous hardware and software roundtables, interactive online interaction, news, gateways to remote databases, etc.
Terminals supported: ANSI is the default, although most character-based work.

MCI Mail

Contact Number: 800-444-6245 or 202-833-8484

To send e-mail from a UNIX system, type: *username*`@MCIMail.com`
No. sites: More than 100,000
Rates: Base line subscription is $35.00 per year per person or $100 per year per site for some corporate subscriptions, plus surcharges based on message size and for special services.
Compose off-line and upload ASCII files?: Yes
Download mail?: Yes
Binary file transfer?: Yes
Gateways and delivery options: Internet (experimental), Compuserve, AT&T Mail, several corporate systems (IBM, others), national packet switching services. Extensive hard copy delivery options through fax, telex, and U.S. and international postal services.
Terminals supported: Most character-based.
Notes: The subscriber figure is for "sites," which means the number of users could be significantly higher. MCI does not release official numbers. Binary file transfer is with a proprietary protocol. Third-party front ends for UNIX, DOS, and Mac systems are available, but not required.

Prodigy

Contact Number: 800-776-3449

To send e-mail from a UNIX system, type: *not available*
No. subscribers: 750,000
Rates: $12.95 per month, with a surcharge for heavy e-mail use.
Compose off-line and upload ASCII files?: Yes
Download mail?: No
Binary file transfer?: not applicable
Gateways and delivery options: None. Internal communication only.
Other Features: Graphics-based. Family-oriented.
Terminals supported: Macintosh, IBM PCs, and home computers with graphic displays. Requires proprietary software.

UUNET

Contact Number: 703-876-5050

To send e-mail from a UNIX system, type: *username@domain.name*
No. sites: 1,700
Rates: $36.00 per month and up, plus an hourly charge that begins at $5.60 per hour.
Compose off-line and upload ASCII files?: Yes
Download mail?: Yes
Binary file transfer?: Yes
Gateways and delivery options: Compuserve, Internet, MCI Mail, AT&T Mail, and SprintMail.
Other Features: Very UNIXy. More than 1,500 megabytes of UNIX archives and free software available for downloading.
Terminals supported: Most character-based. DOS, Macintosh, VAX front-end software available through third-party vendors.
Note: Requires UUCP software.

The Well

Contact Number: 415-332-4335

To send e-mail from a UNIX system, type: *user*`@well.com`
No. subscribers: 4,500
Rates: $4.50 per hour.
Compose off-line and upload ASCII files?: Yes
Download mail?: Yes
Binary file transfer?: Yes
Gateways and delivery options: UUNET, Bitnet, some Internet sites, MCI,Compuserve.
Other Features: Numerous special interest conferences, including many not found elsewhere (six dedicated to different aspects of the Grateful Dead, for instance; one for motorcyclists, etc.). Relatively few technical areas.
Terminals supported: Most character-based.

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CIRCLE NO. 102 ON INQUIRY CARD

to use the UNIX tools you already have. You can send e-mail to a Compuserve or MCI Mail subscriber as easily as you can send mail to anyone else on your own system. For example, provided your computer can reach UUNET or Internet, you can use your regular mail program to send your message to User.Number@compuserve.com. If your colleagues are Compuserve subscribers, you would route mail by using their account number, something like 77777.1234@compuserve.com.

You Pay Money–You Get Connections

The slightly more complicated, more expensive, and more powerful way to send messages is to become a subscriber of one of the electronic services. Suppose you sign up as an MCI Mail customer. Provided you can reach a modem from your terminal, all of MCI Mail's features would be available, just as they would if you used the more common Macintosh or IBM-type PC to log in. You can access other MCI Mail subscribers directly and reach millions more through MCI's gateways: Internet, dozens of European postal services, Compuserve, and others.

Perhaps the main advantage to being a subscriber lies in your ability to send electronic messages to non-subscribers. Suppose your colleague doesn't have a computer. You can have your messages converted to hard copy and delivered to their doorstep by postal service, telegram, telex, or fax. Alan Garratt, an MCI Mail spokesman, sent about 40 pages of ASCII files from his PC to my fax machine while we talked on the phone. He later replied to a follow-up question by sending e-mail to my UUNET and Compuserve accounts.

Because Compuserve and MCI Mail are subscription services, it isn't possible for a non-subscriber to send a message to the service for forwarding as a hard copy message.

Beyond the realm of e-mail, but related to the community of computer users, is another advantage to being a subscriber to an electronic service such as BIX, Compuserve, or The Well. Each bills itself as an information service, rather than a basic communication service. Access to news, software and hardware support, tremendous amounts of online research data, games, interactive discussion groups, downloadable UNIX files, and other pursuits are all a modem call away.

Now for some bad news. Staying away from the core group of large interconnected networks and information services are several closed network holdouts, but their numbers are dwindling. The unreachables include Prodigy's claimed 750,000 subscribers who are locked into the PC-oriented, graphics-driven system. And there are no plans to set up a gateway, according to Steve Hein, a Prodigy spokesperson. "We're not an e-mail service. We have personal messaging between members," he says.

Genie, the large information service run by General Electric, is also a closed system, but has plans to try an Internet or UUNET gateway by the end of this year. BIX, the *Byte Magazine* service, will be reachable by the end of the year.

Clearly, the trend is toward connectivity. Chances are, you can already get a message there from here. And if not, just wait a while. The rest of the world is plunging forward to reach the e-mail advantage that UNIX users have enjoyed for years. ■

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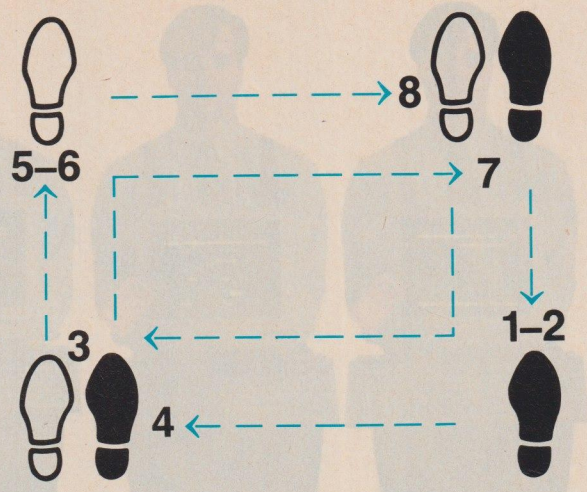

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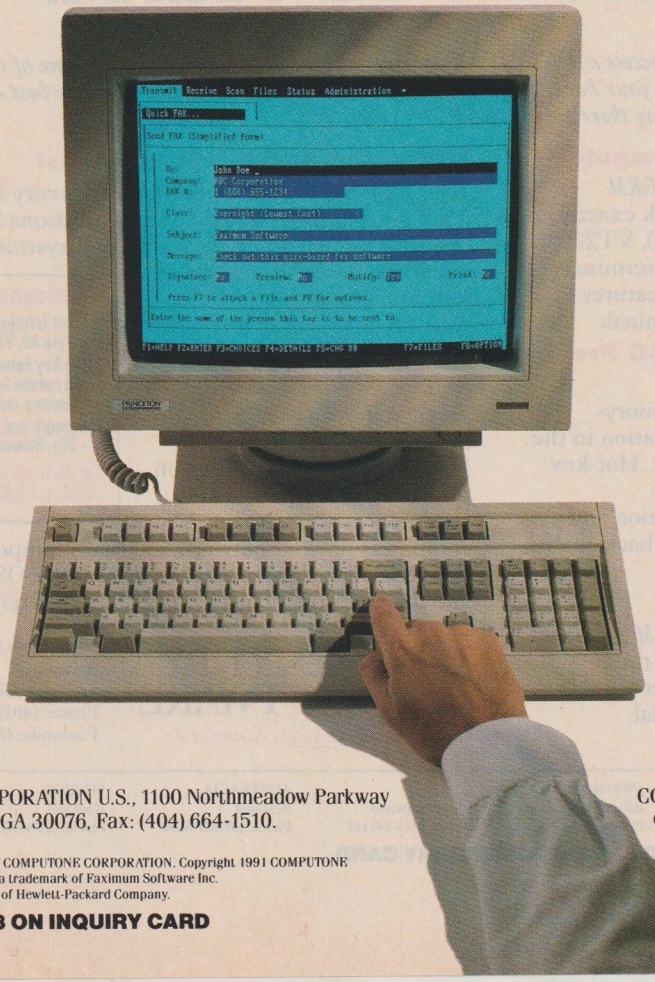

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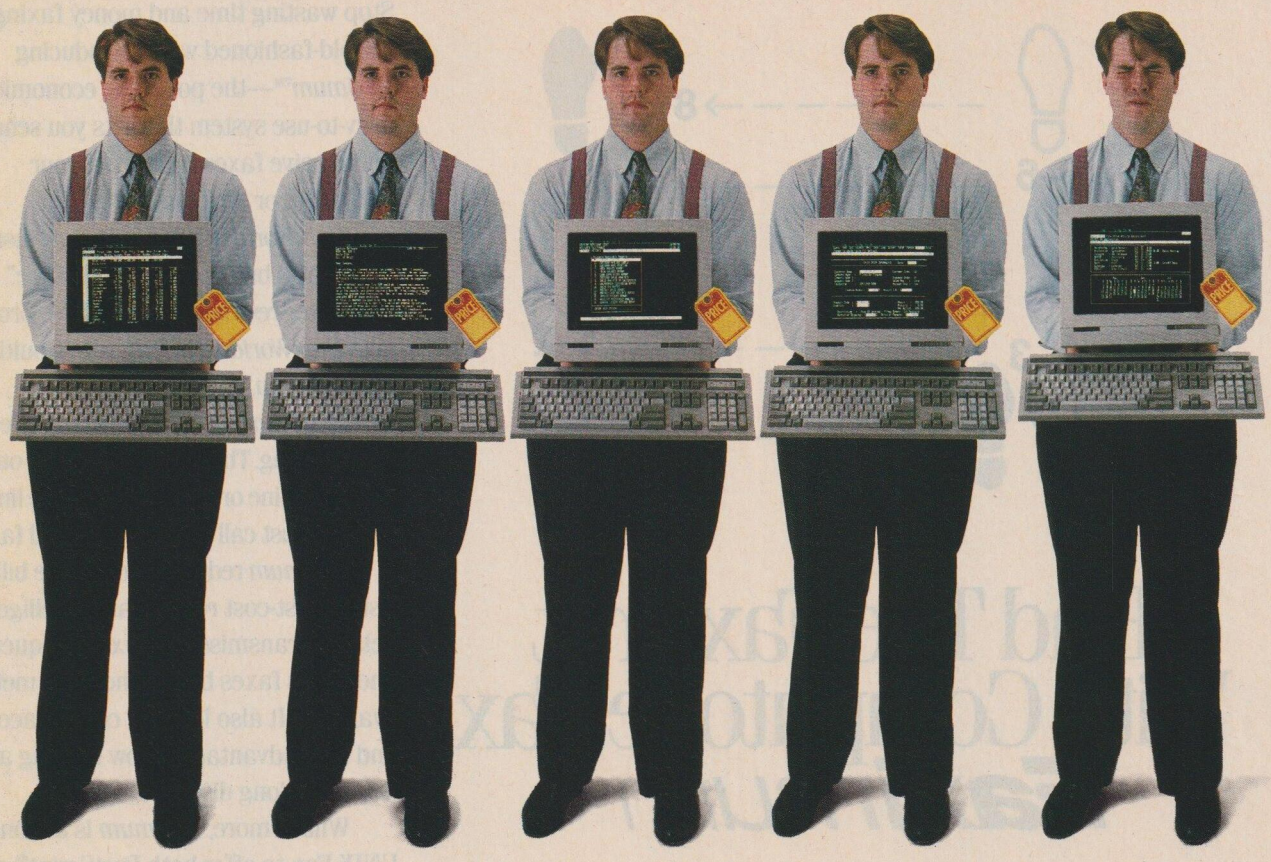

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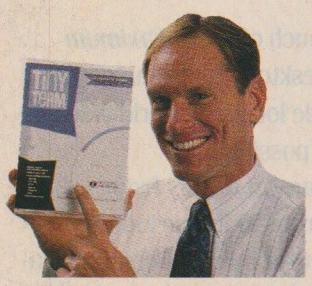

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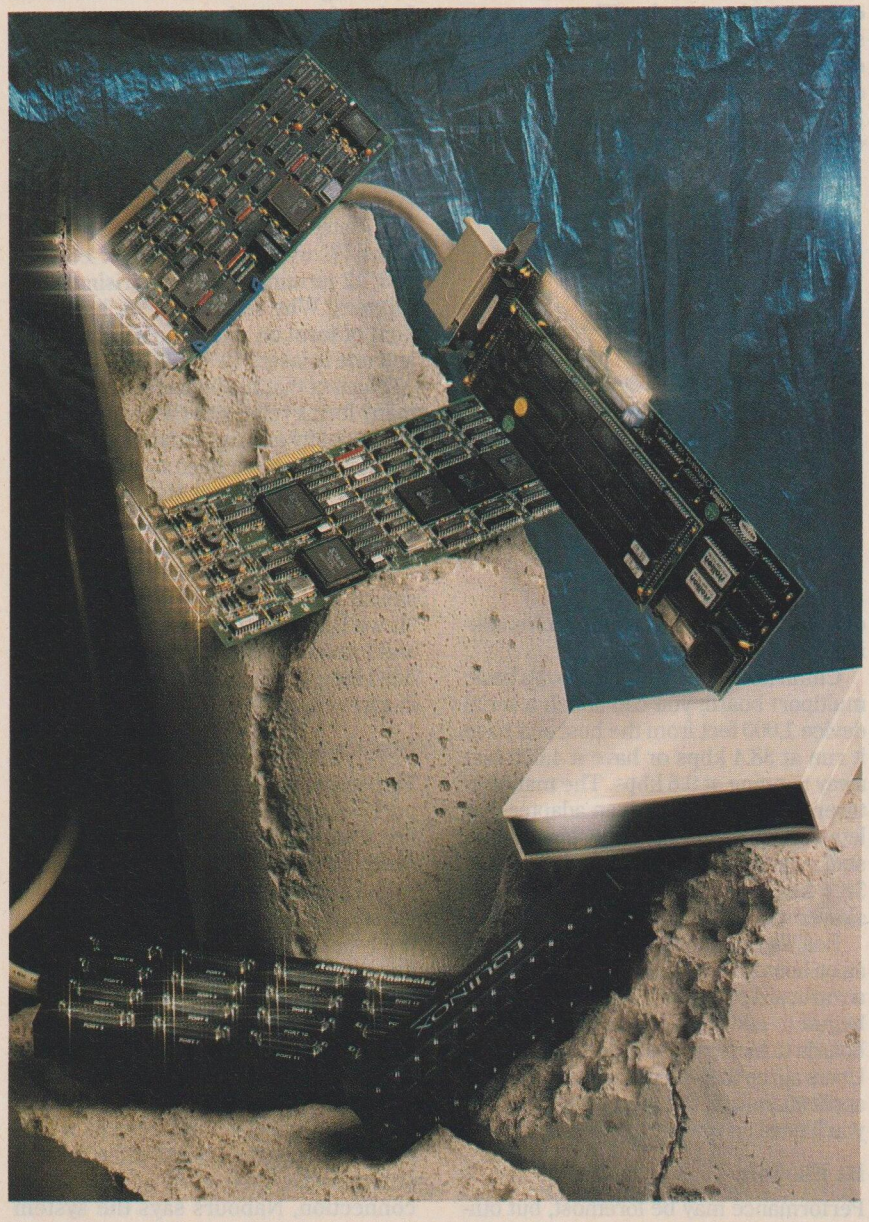
CIRCLE NO. 65 ON INQUIRY CARD

Which Multiport in the Storm?



GERRY ZAGER MULTIPORT BOARDS COURTESY COROLLARY, EQUINOX, AND STALLION TECHNOLOGIES

A multiport board in a PC gives you the lowest cost per seat. Here's how you choose from the hoards of boards

By Howard Baldwin

If you want to set up a multiuser UNIX system without spending a lot of money, multiport boards are your simplest solution. Like any other board, multiport boards slip into a slot in a desktop machine. Once installed, you can use them to attach terminals, printers, and modems by RS-232 cable. Voila, it's a system.

Multiport boards have recently become as much of a commodity as PCs and there are dozens of manufacturers around the world. There are still some differentiating factors, however. If you want to set up a system based on a desktop machine, whether its a PC or workstation, you have to know certain characteristics of multiport boards and which ones will best suit your environment and applications.

Decide how many users you will have and how far away from the host device they will be. These two factors lead to what many users and system integrators consider the most important factor in your decision: acceptable performance. The more users there are, the slower the response time they'll have on a multiuser system. In addition, you

have to consider the trade-off between speed and the distance from the host. The farther away the user is from the host, the slower the communication speed must be to keep a reliable connection.

In addition to these hardware issues, there are some technical issues to consider. Instead of a multiport board, you may need a cluster controller. An external device that also turns a desktop machine into a network host, a cluster controller gives you greater flexibility in distance. The myriad options can become daunting. Here are some ways to decide which boards are for you.

Command Performance

Users and integrators list numerous factors to consider in the purchase of a multiport board. Among them: reliability, expandability, flexibility, and quality of the vendor's support. But foremost on almost everyone's list is performance.

"The purpose of an intelligent serial port card is to offload the CPU from dealing with the serial I/O," explains Tim Grice, UNIX engineering manager for MicroAge's franchise operations. "The more efficiently the multiport board provides that service, the less involved the computer's CPU has to be." Although MicroAge is a reseller, the company uses Equinox boards installed in Compaq Systempros to serve 150 of its 180 employees across the southwestern United States.

Grice describes system performance on a sliding scale. If you could find the fastest multiport card on the market, one user would have the very best performance. The more users you put on the system, the more you'll notice diminished performance. Unfortunately, you can't judge what to buy by the number of users.

David K. Taylor, planning program coordinator for the city of Tucson's (Ariz.) Department of Planning, says "If I had 50 travel agents accessing a database, nobody's multiport board is going to handle that. On the other hand, if not all your users are working at the same time, and much of the use is not CPU-intensive, then many different [products] might be suitable."

In Taylor's office, 50 users access a 386-based PC using Corollary's cluster controllers. Multiport boards and cluster controllers perform similar functions–add serial devices–but cluster controllers are usually used when peripherals are more than 1,000 feet from the host. "One board gives me [access for] 32 users. The cluster controllers have some smarts in them, and because planners pound characters, it offloads lots of processing."

The other performance factor to consider is the baud rate of the serial port on the board. Most run at of 9,600 bits per second (9.6 kbps) or some multiple of that: 19.2 or 38.4 kbps. Find the maximum rate for the multiport board–you can run different ports at different speeds, but the farther you run RS-232 cable, the slower your baud rate will have to be.

Look for varying degrees of flexibility in this regard and prepare for a trade-off between speed and distance. Jeff Chinn, president of systems integrator Micro Accounting Solutions, says this situation comes up frequently. "There's a conscious effort for large institutions to downsize. We have been putting in some of our largest systems with Intel-based [PCs]. I'm working in some institutions where if you wanted to get from one side of the building to the other, you're talking two miles of cable."

Prepare for a trade-off in performance between speed and distance

Chinn notes that with Equinox's basic multiport board, you can attach a serial device 1,000 feet from the host and have it run at 38.4 kbps or have it 4,000 feet away running at 9.6 kbps. The manufacturer has come out with an adapter that lets you triple the distance. You can install a device 3,000 feet away that runs at 38.4 kbps, or 12,000 feet away at the slower rate of 9.6 kbps.

Boards can either be "dumb," without an on-board processor, or "intelligent," with an on-board processor. Some vendors have begun to add RISC-based chips to their boards to increase the processing power. Users agree that the more intensive your applications are, the more likely it is that you'll need an on-board processor.

Be Flexible

Performance may be foremost, but other issues come up when you're thinking about multiport boards. One of Chinn's customers is Loren Meade, controller for Buse Timber and Sales. Meade's advice: Be flexible and think about expansion capabilities. He replaced an IBM System/36 with an Acer PC, running XENIX fitted with Computone multiport boards, to run the company's accounting and lumber inventory system. It worked so well that Meade decided to set up a leased telephone line so the main office could communicate with a company mill in another city.

"We had to upgrade the system [when] we brought the mill on line," Meade remembers. "We had four devices and a printer on the System/36 and we thought that was all we would need. In just four months, we were past our first eight-port board and onto the second. It just ballooned." Whatever you think you're going to need, "double it," he advises.

Other users concur. Sam Birnbaum is the executive director of a physician's group called Pulmonary Rehabilitation Associates. His system consists of a 486-based PC with Specialix cluster controllers, 12 terminals, and, surprisingly, six printers. Why so many? "We have one kind of form on one, labels on another, and one is laser," he explains.

The fact that his business requires so many forms relates to Birnbaum's need for flexibility and expandability. "We never know when we need to add another form, or procedure, or statement. We're not locked in–we can change almost anything that we have in-house at will."

Birnbaum's needs are remarkably similar to almost any corporate situation. "If we [hire] another doctor tomorrow, and I need another six plugs [ports], we don't have to mortgage the farm to bring in more capabilities."

Not Always Simple

The serial devices that plug into multiport boards and cluster controllers are not always just terminals and printers. They can be modems or other communication devices, which brings up a whole other set of issues. Taco Bell has discovered this in the process of developing a system for its 2,000 fast food restaurants, according to senior analyst John Nabours.

The computer will communicate with the devices in the restaurant, such as the timer at the drive-through window that logs how long people have to wait. Because the peripheral devices would be polled over the RS-232 cable at regular intervals, instead of by a constant connection, Nabours says the system didn't necessarily need a card with an on-board processor. He chose one from Stallion Technologies because it was priced close to non-intelligent cards.

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"We wanted to keep the price to a minimum," Nabours notes, "because our multiplier [the number they'd ultimately need] was 2,000."

Other companies, such as Kodak and DHL Systems, are setting up modem-only systems. According to internal systems integrator Mark Hilliard, Kodak is setting up a bank of UUCP (UNIX mail) connections to tie the UNIX systems at the company's Rochester, N.Y. headquarters to its broadband network. When considering the difference between boards used with terminals and boards used with modems, Hilliard notes that "throughput is just as important on a system with lots of terminals as it is on a system with lots of modems. But problems arise in UUCP, [because] most of the time, the system sends packed, compressed data over high-speed modems."

Hilliard has set up his system to run at 19.2 kbps using Equinox boards. "A lot of the boards can't keep up," he says. "I think UNIX UUCP and broadband connectivity places more of a load on the serial board."

Peter Blair, senior programmer with DHL, is setting up a system similar to Kodak's only in the fact that it uses modems. DHL's system is designed to let users call in and track their shipments through a UNIX-based PC that acts as a front end to a DHL mainframe. Blair is creating a prototype that will eventually be replicated in DHL sites around the world.

Although he's using Maxpeed's multiport board in the prototype, and may use it in the production machines, Blair says he's tried not to limit himself to one board. "In some parts of the world, it's hard to get certain boards." In fact, aside from considering price and availability, his advice revolves around ease of installation. "Does it come with all the cabling required for modems and terminals? There is a distinction," he explains. "You want to make sure that it installs easily, and that if it doesn't, it's easy to find out why. I've been in places like Bangkok where it takes three hours to get a new connector because the [street] traffic is so bad."

How to be Board-Certified

Most multiport installations aren't as extensive as these corporation's examples. One of the most common implementations of a multiport system is in retail applications. There multiple cash registers, or point-of-sale devices, register information on a single host, from which the accounting department can download sales and inventory information.

Because the basic components are inexpensive, some users set up their own in-house testing situations. In-house testing is logical, especially if the system is going to be replicated in multiple retail installations. Don Hill, communications manager for Dunn-Edwards Paint Company, set up such a system using some Sun Microsystems 386i workstations and Digiboard boards.

Once the test system was set up, "we loaded the store software and connected two boards, 12 terminals, and two printers. Then we just banged away on it to [make sure] it had a reasonable response time. We looked up customer names on a 40,000-name database."

What the Reseller Saw

If you decide to turn the purchasing question over to a systems integrator, you should still ask how *they* came to their conclusions. Most of the integrators we contacted use the boards of one or two different vendors, but have tested or used many others.

Ask how the resellers tested the boards. At MicroAge, according to Grice, they devised a simulation and diagnostics program to test cards and ran it in their office. "We installed the ones we thought would be successful in a controlled number of field evaluations and determined how they worked for customers." They tested the cards both on how easy they were to install and how reliable they were once they were in use. Grice cited both Digiboard and Equinox boards for their reliability, but decided to go with the latter because of the vendor's responsiveness in handling questions and problems.

Make sure the reseller has sufficient experience with the board–you don't want your installation being used as a guinea pig by the reseller without your knowledge.

Also, ask how they've handled the memory addressing for the card's drivers. This is a technical problem that buyers and integrators mention almost unanimously. Most PCs have up to 16 megabytes of addressable memory. In the past, many board manufacturers assumed that the 16th megabyte would be unused and wrote their drivers to use that space. Alternatively, they wrote the drivers to work in the lowest megabyte of addressable memory.

The challenge has evolved to encompass two problems. Some board manufacturers use the first megabyte and some default to the 16th megabyte–there's not necessarily any consistency. And now that desktop machines are becoming more powerful, users are adding more RAM so that the 16th megabyte is frequently accessed by the software application. Ask your integrator how they've solved the memory addressing problem for the particular PC and multiport board they're recommending.

For something as seemingly simple as slipping a board into a PC and plugging in some jacks, multiport purchase can be a complicated project. Even before you consider which one you want, you have to discern what your needs are in terms of on-board intelligence, distance, applications and, ultimately, performance.

Once you've determined your needs, users recommend finding out more about how easy the board is to install, how reliable it is, and how easy it would be to expand your system. Ultimately, the best advice might be patience. Because multiport boards are a commodity, many users had used and discarded several before determining their favorite.

In any case, it's comforting to know that when it comes to multiport solutions, the product selection is both extensive and inexpensive. ■

Selected Multiport Vendors

Computone 1100 Northmeadow Pkwy., Roswell, GA 30076; 800-241-3946 or 404-475-2725

Corollary 17881 Cartwright Rd., Irvine, CA 92714; 714-250-4040

Digiboard 6400 Flying Cloud Dr., Eden Prarie, MN 55344; 612-943-9020

Equinox 14260 SW 119th Ave., Miami, FL 33186; 305-255-3500

Maxpeed 1120 Chess Dr., Foster City, CA 94404; 415-345-5447

Specialix 985 University Ave, Ste. 12, Los Gatos, CA 95030; 408-378-7919 or 44-0932-354254

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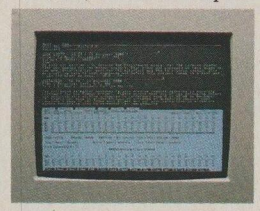

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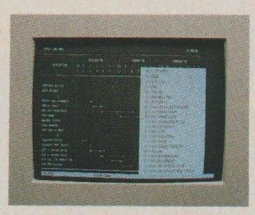

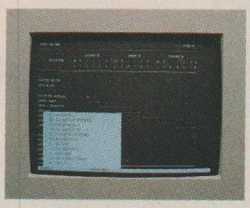

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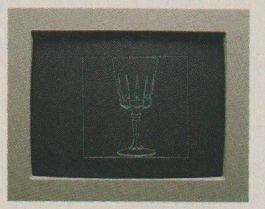

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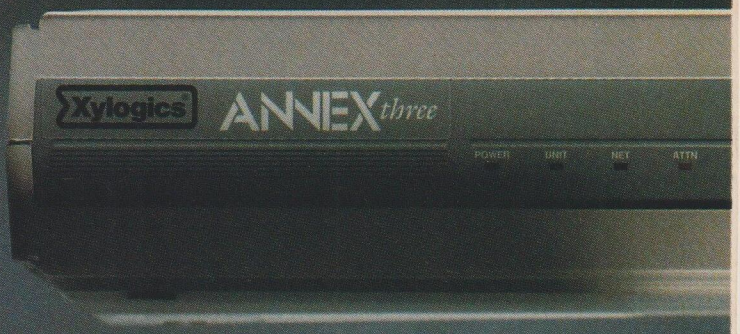

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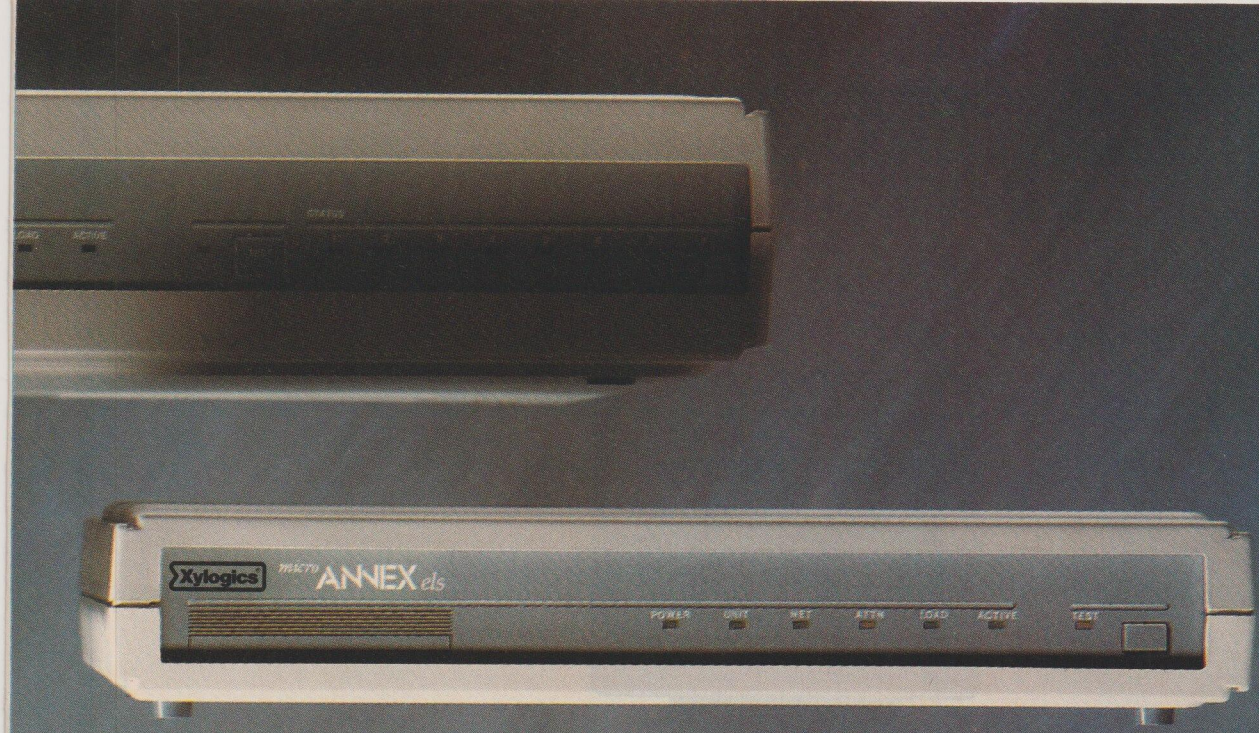

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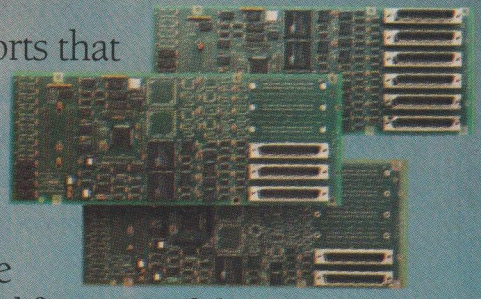

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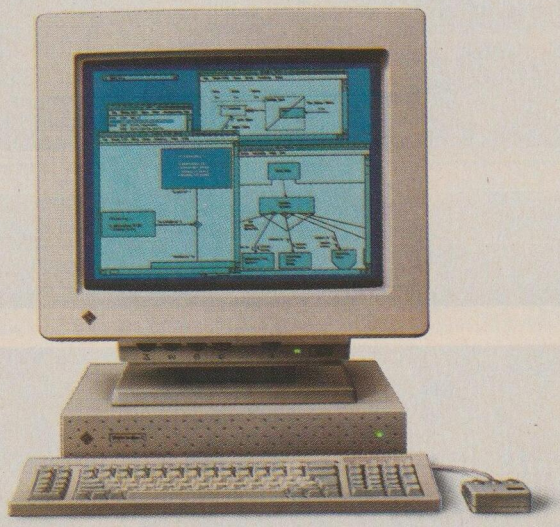

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CIRCLE NO. 52 ON INQUIRY CARD

HP's Dual Approach to Workstations

By Jim Murray

You make the choice: blinding fast RISC or traditional Motorola CISC at half the cost

Supporting multiple processors is nothing new for Hewlett-Packard. With this year's introduction of the speedy 9000/700 RISC series, as well as some new 9000/400 Motorola-based systems, HP is challenging the low and high ends of the desktop workstation market.

The attraction of the 9000/700 series is blinding speed. The series is based on HP's version of RISC, called Precision Architecture (PA-RISC), which has catapulted workstations into a new performance realm. The Model 720 turns out a SPECmark of 59.5, some 30 points faster than the IBM RS/6000 Model 320, the previous speed leader in entry-level workstations. As for price, at $11,900, the Model 720 costs about $2,000 less than the RS/6000 Model 320. If you need even faster performance, the 9000/730 scorches out a SPECmark of 76.8 and sells for $19,990.

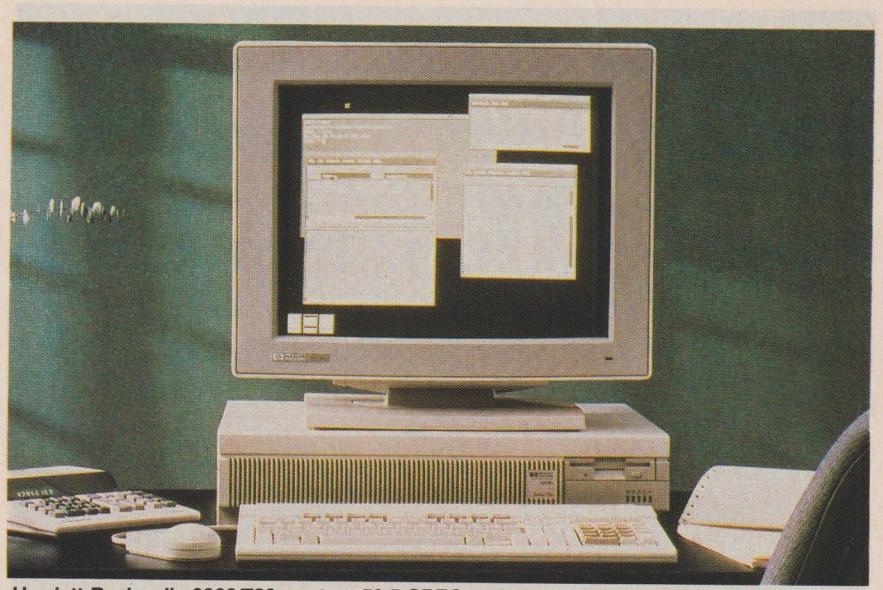
Meanwhile, there's the 9000/400 series. Our Model 425e loaner was a workhorselike machine, with a 25-MHz 68040 processor. The 425e's base price of $5,490 is reasonable, but adding a 200-megabyte disk adds $2,000 while a 400-megabyte disk is $3,500. With its 19-inch color monitor, the 425e provides a decent value–and competes in price with the likes of Tatung's Compstation 20 and Sun Microsystems' IPC. As for performance, the 425e holds its own: its SPECmark of 11 surpasses the Compstation's 8.3, but trails the IPC's 13.4.

Comparing the two types of systems, we surmised, would tell us about HP and its future in UNIX. HP is currently a powerful force in UNIX and only trails Sun for the most workstations sold last year. HP is also holding out a carrot to the UNIX community with its plans to move its much-touted NewWave interface from DOS to UNIX soon. What's more, HP has done some exceptional work in customizing the OSF/Motif window manager which, although it bucks open systems, is good software.

Internally, parts of HP seem to be reeling from the acquisition of Apollo Computer in 1990. We had to deal with two sets of HP personnel to get the review systems. According to HP, the loaner pool for the 9000/700 series consists of two Model 720s–a fact that seems counter to HP's earlier claims that it was opening up the marketing and communications channels for the 9000/700 series.

When we received a Model 720 machine, the system software had been stepped on by previous users and we couldn't be sure what was what. The lack of system documentation made matters even worse. HP had simply run out of it. We waited two weeks before software documentation arrived, another two weeks for system hardware documentation, and three weeks for a tape containing the factory-set system software. These delays irked us, but we know software engineers and other compute-intensive people are the audience for the 700 series–so we figured they could stumble through, mostly unimpaired, as we did.

continued



Hewlett-Packard's 9000/720 posts a 59.5 SPECmark and a $11,900 base model price tag. HP's PA-RISC architecture puts the 700 series on top for performance in its class.

HP's Two-fold Product Line

MODEL 9000	720	730	750	425e	425t
Processor	PA-RISC	PA-RISC	PA-RISC	68040	68040
Processor Speed (MHz)	50	66	66	25	25
SPECmarks	59.5	76.8	77.5	11	11
RAM (megabytes)	16-64	16-64	16-192	8-48	8-64
Instruction Cache (kilobytes)	128	128	256	4	4
Data Cache (kilobytes)	256	256	256	4	4
Internal Disk (megabytes)	840	840	40GB	840	840
Max. Disk Capacity (gigabytes)	10	10	10	9.1	9.1
CD ROM (megabytes)	600	600	600	600	600
4mm DAT (gigabytes)	1.3	1.3	1.3	1.3	1.3
1/4-inch Tape (megabytes)	N/A	N/A	N/A	60	60

The Model 720 we tested included 32 megabytes of system memory, a CRX 2-D/3-D color graphics card with a 19-inch color monitor, two internal 200-megabyte hard disks, an external 600-megabyte hard disk, and an external 1.3-gigabyte tape drive. The price of this configuration was $39,465, plus an additional $1,870 for the C compiler, which was also included.

The tested Model 425e included 16 megabytes of system memory, built-in graphics with a 19-inch color monitor, an internal 200-megabyte hard disk, and a 3 1/2-inch floppy disk drive. The price of this configuration was $14,490, plus another $1,870 for the C compiler.

Snaking the Model 720

The design of Model 720 is a healthy departure from the standard fare. Borrowing from designs in test equipment, the 720 consists of five removable modules. Four of the five modules are accessible from the back of the system unit, replete with thumbscrews and handles that let you easily slide them out of the case. The fifth module is a plug-in board inside the 20-by-18 1/2-by-4 1/2-inch case.

When we powered up the system for the first time, it asked us a series of questions including the network name and address for the machine. Once we had answered the questions, the machine finished the boot sequence and displayed the login screen. We logged in as "root" and, using the system administration monitor (SAM), were able to add a user account and configure the rest of the system, including the Network File System (NFS), with ease.

The fact that we were able to set up and configure the machine without the manuals, attests to the user-friendly design of the system administration software and the consistent software interface. Any time you need to fill in a system administration field, you can pop up a list of possibilities, move the cursor to the correct option, and press a key to fill in the field and exit.

As for architecture, HP is at the top of the heap with its PA-RISC technology. Although HP has offered this technology in its large mainframe and multiuser systems since 1986, the 9000/700 series marks its first appearance on the desktop. The heart of a 9000/700 system is the CPU board, which has three large fin-cooled CMOS chips: the CPU for integer and memory management; the FPU for floating-point processing, including 2-D and 3-D operations; and the I/O controller chip, connected to the CPU and the 32-bit multiplexed address/data bus. This creates fast I/O transfers because the bus runs at the same speed as the CPU–55-MHz in the case of the Model 720.

The 9000/700 series has a truly integrated architecture. With the exception of the monitor and a few minor components, the 9000/700 series is HP through and through, including the processor, system bus, and compiler. Instead of using on-chip caches–a technique popular in third-party processors–HP engineered the 9000/700 series to use separate instruction and data cache memory arrays, each using discreet memory to service the CPU or FPU. Overall, the larger cache size serves to reduce miss rates in caching. Instruction caches can be configured from four kilobytes to four megabytes. Data caches can range from four kilobytes to two megabytes.

On the application front, the 9000/700 series fares as well as any HP UNIX product. Because the 9000/700 series is binarily compatible with the 9000/800 series machines, a ready base of applications are available. The strongest software areas for the 9000/700 are mechanical engineering, scientific visualization, geographical information services, computer-aided software engineering, artificial intelligence, electronic design automation, and CAD/CAM. Commercial business applications are not as diverse, but include a good assortment of database and desktop publishing packages, as well as products including Uniplex, Informix's Wingz, and Clarity's Rapport.

The Motorola-Based 425e

The Model 425e is a tribute to HP's support of the Motorola processor line. Al-

Review Highlights

	HP 425e	HP 720
CONTACT INFO	*Hewlett-Packard* 19310 Pruneridge Ave. Cupertino, CA 95014 408-725-8900 or 800-752-0900	*Hewlett-Packard* 19310 Pruneridge Ave. Cupertino, CA 95014 408-725-8900 or 800-752-0900
⊕	A powerful workstation with an excellent display. Numerous technical and commercial applications. Excellent documentation.	The fastest workstation on the market. Excellent display, blindingly fast graphics, numerous scientific and engineering applications, and excellent documentation.
⊖	Only a 90 day warranty. The memory expansion is severely limited and there is no choice in keyboard design.	Only a 90 day warranty. The memory expansion is severely limited and there is no choice in keyboard design.
PRICE	$5,490 and up.	$11,990 and up.
SUPPORT	Through the HP response center and local offices; same- and next-day on-site maintenance. Various levels of software support and maintenance available.	Through the HP response center and local offices; same- and next-day on-site maintenance. Various levels of software support and maintenance available.
WARRANTY	90-day hardware and software.	90-day hardware and software.

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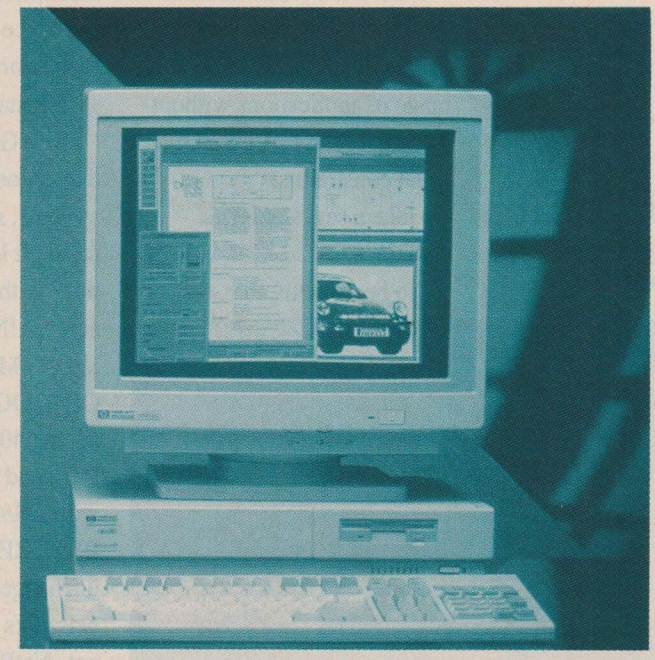


The Model 425e uses Motorola's 68040 CISC processor and looks and feels identical to the 720 except in speed. The 425e is targeted at software developers, desktop publishers, and business users, and most major UNIX applications are ported to HP-UX, HP's version of UNIX.

though competitor Sun has discarded the slower CISC technology, HP has continued to support it. This results primarily from HP's already large installed base of Motorola-based workstations. It is for this base of software developers, desktop publishers, and business users that the 425e is targeted.

The Model 425e sells for $5,900 in a diskless version and comes in one very large box that takes two people to handle. The Motorola 25-MHz 68040 system has a small footprint like the 9000/720. The footprint is only 16 1/2 inches wide, 14 inches deep, and 3 inches high. With cables, the depth grows to about 20 inches. When we removed the system unit cover, it revealed a large system board holding most of the electronics, a power supply, and two disk bays. The 425e uses standard 68040 technology and compares to a similarly priced Nextstation in performance.

The 720 configuration as delivered is quite usable as a software development system even without using the external 660-megabyte drive. The 425e, however, needs a bigger disk before you can consider using it for program development. There were only about 10 megabytes of free disk space available on the system when delivered–even without some of the C tools, such as **lex** and **yacc**, loaded. A more reasonable machine for program development would need a 400-megabyte disk, adding another $3,500 to the price of the 425e.

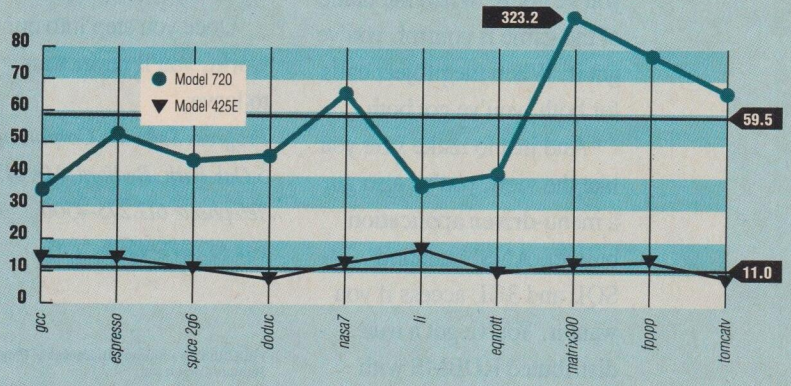
We evaluated the Model 425e after extensive use of the 720. The two machines look and feel identical. The only major difference is the superior speed of the Model 9000/720. The implementation of HP-UX on both systems is transparent and the entire set of programs we ported to the systems compiled and ran identically on both machines. These included both X-based and non-X programs.

The 425 series is binarily compatible with the rest of the 400 series and most major applications available for UNIX have ports to HP's Motorola-based systems, including the gamut of UNIX desktop publishing, word processing, spreadsheet, and CAD packages.

A Tale of Two Architectures

Nowhere is the difference betwen RISC and CISC processors more acute than with Hewlett-Packard's 9000/720 Precision Architecture RISC system and 9000/425e Motorola-based CISC system. The model 720 turns in the fastest SPECmark of any "low-end" workstation with a 59.5, surpassing previous low-end leader, the IBM RS/6000 Model 320, with its current SPECmark of 32.8.

The 720 also blows away its sister product, the 425e, which scores 11.0. The 425e, however, sells for $5,490 in its base configuration, less than half the price of the 720. In perusing the SPEC results, note the 720's excellent floating-point performance (spice, doduc, nasa7, matrix300, fppp and tomcatv).



Both the model 720 and 425e ran HP-UX 8.05M, HP's version of System V.
Both machines were configured with 16 megabytes of memory and 660 megabytes of hard disk.

SOURCE: Hewlett-Packard as supplied to SPEC Consortium

Double Vision

The quality of the video display is outstanding on both systems. The 1280-by-1024 resolution, coupled with the 72-HZ vertical refresh rate, delivers a sharp screen. The display speed on the 9000/720 is impressive, but the 425e is a little on the slow side when scrolling. We suspect that this is due to the lack of graphics hardware.

The machines come up in HP's Visual User Environment (VUE), which is an enhanced version of Motif 1.1 (see "Friendly Desktops" in the September 1991 *UNIXWORLD* for a review of VUE). VUE, like everything else, works identically on both machines. One thing we noticed is that the default terminal program **hpterm** only does smooth scrolling and this can be slow on the 425e. We prefer to use **xterm** with the jump scroll option on the 425e.

The HP-UX operating system, HP's UNIX port, is a rock-solid mature port of UNIX. HP-UX is basically System V with Berkeley fast file system and Berkeley Networking. It complies with version three of the X/Open portability guide, Posix 1003.1 FIPS 151-1, and SVID2 interface specifications.

The optional C compiler is excellent. It

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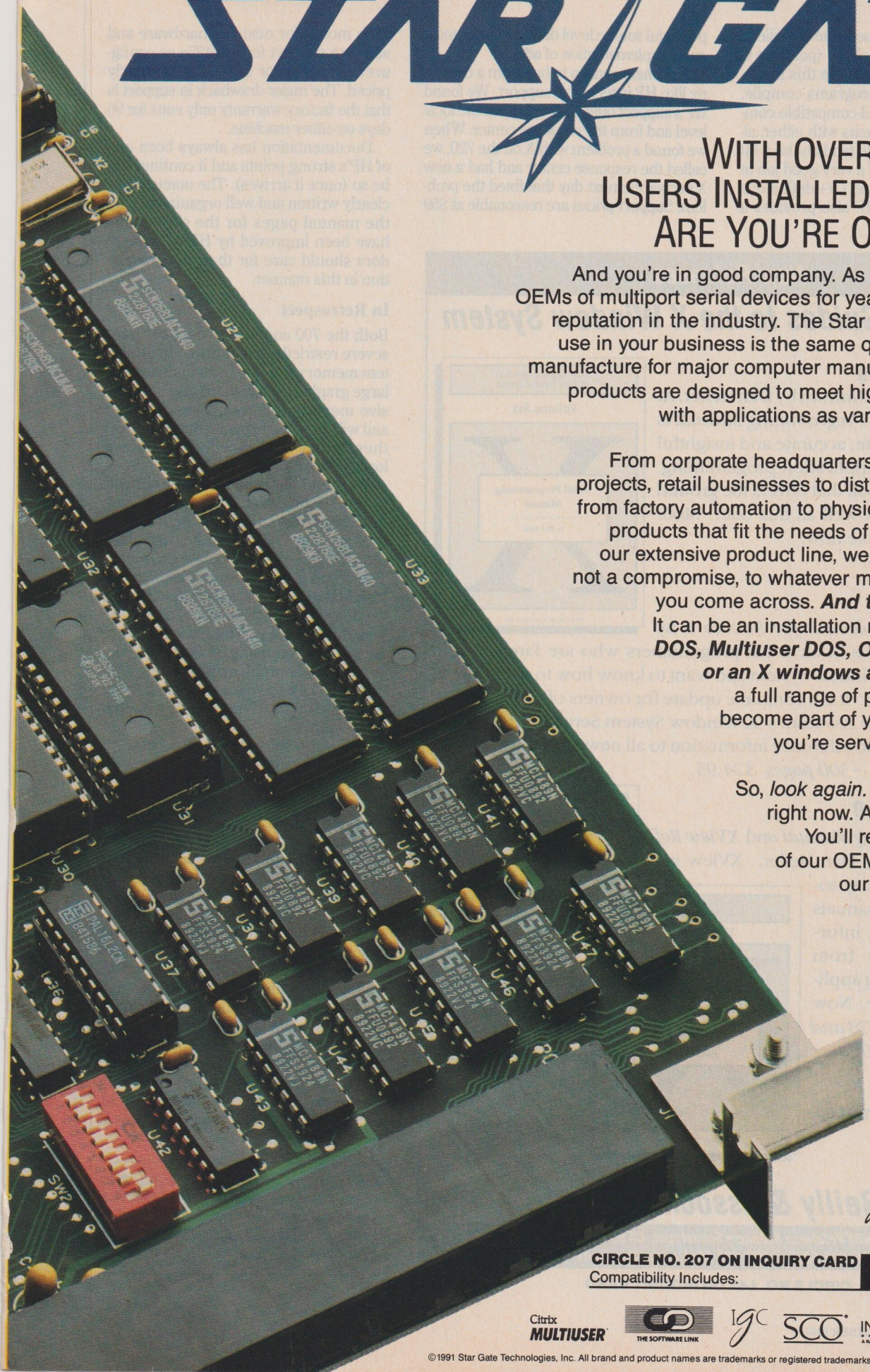

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actually looks like two separate compilers. The first is a traditional pcc (portable C compiler) UNIX compiler. In this mode, all traditional UNIX programs compile. The second is an ANSI-compatible compiler. We had no problems with either, although the ANSI mode tends to be a bit pedantic. HP has done a very good job of adding ANSI, Posix, and C++ definitions to the include files. HP also provides a powerful source level debugger **xdb** and a good implementation of **adb**.

A primary reason to buy from a company like HP is technical support. We found HP's support outstanding both at the local level and from the response center. When we found a problem with X on the 720, we called the response center and had a new X server the next day that fixed the problem. Support prices are reasonable at $59 each month for next-day hardware and software support for the 425e as configured; support for the 720 is similarly priced. The major drawback in support is that the factory warranty only runs for 90 days on either machine.

Documentation has always been one of HP's strong points and it continues to be so (once it arrives). The manuals are clearly written and well organized. Even the manual pages for the commands have been improved by HP. More vendors should care for their documentation in this manner.

In Retrospect

Both the 700 and 400 model lines have severe restrictions in the amount of system memory they support. In this age of large graphics applications and inexpensive memory this seems very strange and will most likely put an upper limit on these otherwise excellent machines long before the speed will.

We found the keyboard very difficult to use. HP has elected to make the control key narrow and place it between the caps lock key and the "A" key and place the ESC key directly below caps lock. The result is that we often brush caps lock and get into caps lock mode when we don't want to. This would almost be bearable if there was a caps lock indicator as found on many other keyboards. We solved our problem by prying off the caps lock key and we suspect that there are lots of other HP keyboards with this key missing.

As for the software environment, we have a complaint about the lack of traditional X11 tools. From an X11 developer's standpoint, some of the basic tools are not present, including **imake**, the standard tool for building X applications. These tools are available as part of the MIT X11R4 distribution and it was not difficult to port them to either platform, however.

Overall, we feel positive about both machines. The strongest advantage point of the 720 is its blinding speed. Both machines rate high for documentation and ease of installation. And with the exception of memory, both machines rate well for expandability. The compatibility between the two machines is excellent: from a developer's point of view, the fact that the two machines are different architectures did not present any problems in porting programs. ■

Jim Murray is an independent software engineer. He can be reached on the Internet as **jjm%jjmhome@lectroid.sw.stratus.com** *or UUCP as* **uunet!lectroid!jjmhome!jjm**

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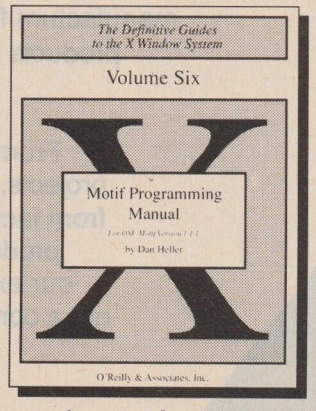

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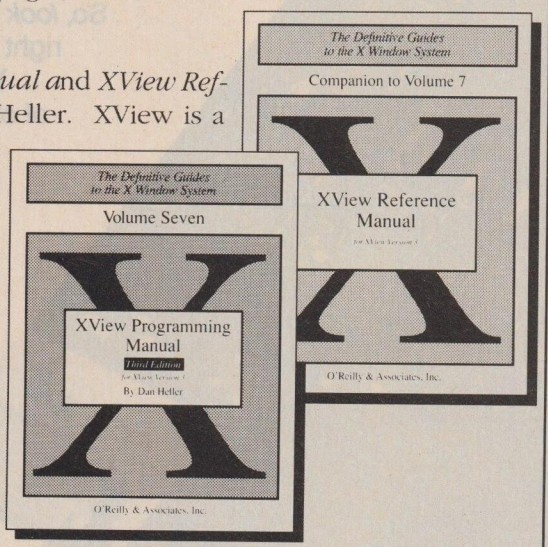

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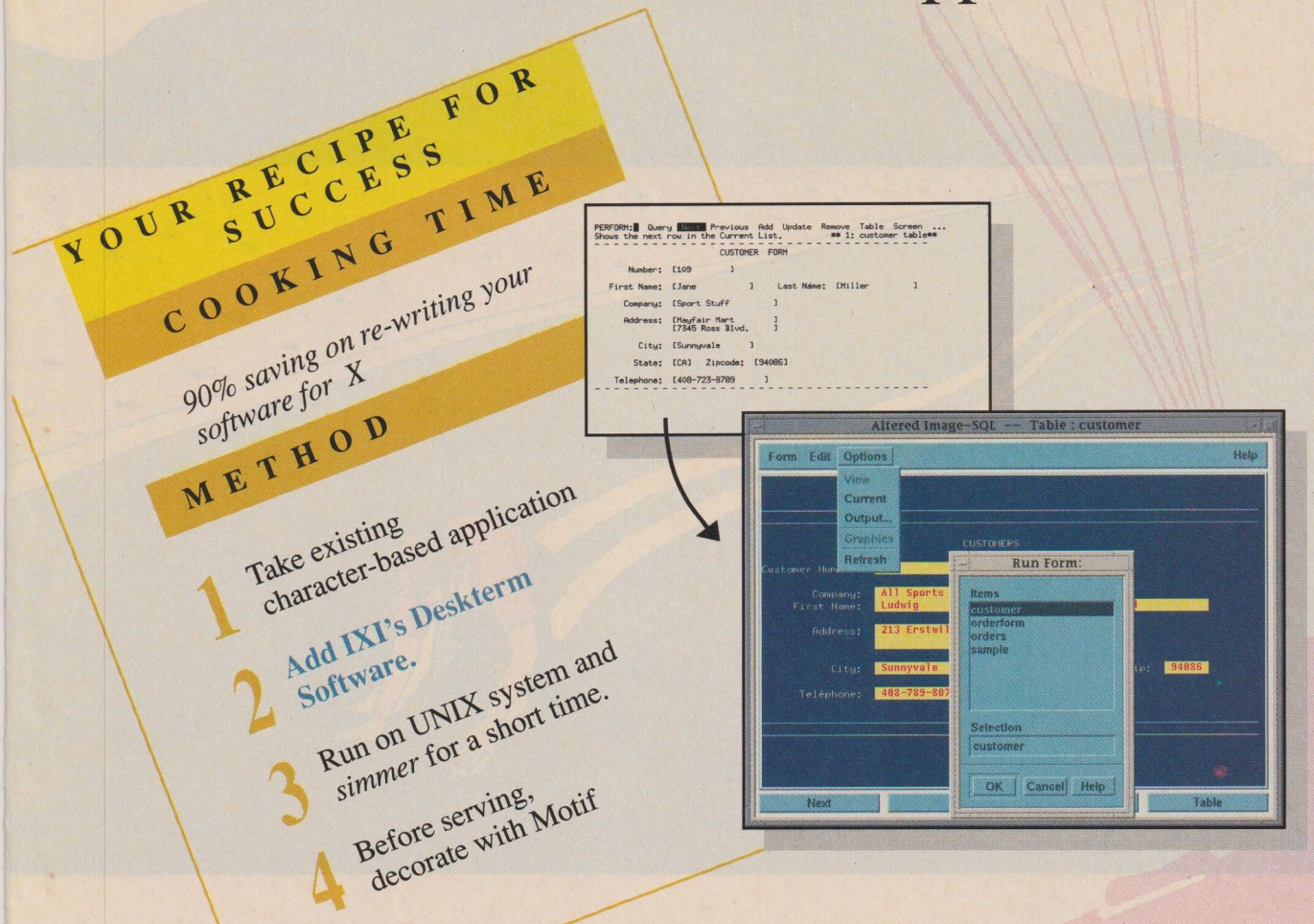

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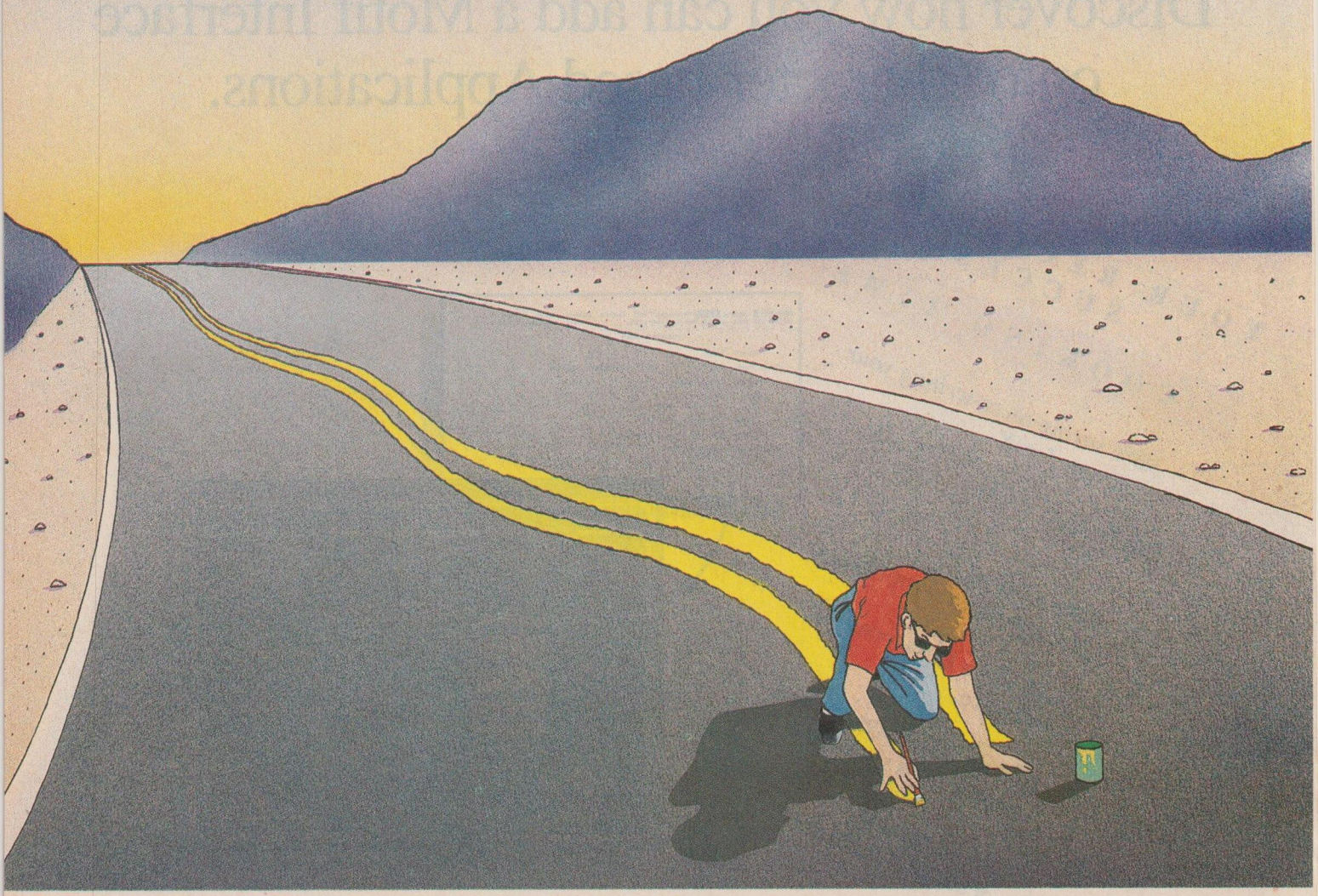

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SERVING UP X FROM A PC

By Mike Burgard

Three PC-based X servers join X Windows and Microsoft Windows

Running X Windows under Microsoft Windows is one of the hottest topics around. So, here's a second look (see November 1990 *UNIXWORLD* for a previous review) at the specialized X servers that play matchmaker in this unlikely marriage: X11/AT from Integrated Inference Machines (IIM), HCL-Exceed/W from Hummingbird Communications Ltd., and XVision 4.0 from Visionware Ltd. In general, we liked what we saw. We especially liked X11/AT, which has more features than we knew were possible in an X server.

X servers based on Microsoft Windows are not entirely new. Visionware and IIM first released XVision and X11/AT in 1989. Only Hummingbird's HCL-Exceed/W was released within the last year. The limitations of earlier Windows versions prevented these products from being viable alternatives to X terminals, but the latest versions take advantage of the X Version 11 Release 4 server specifications and ride the wave of Windows 3.0's success.

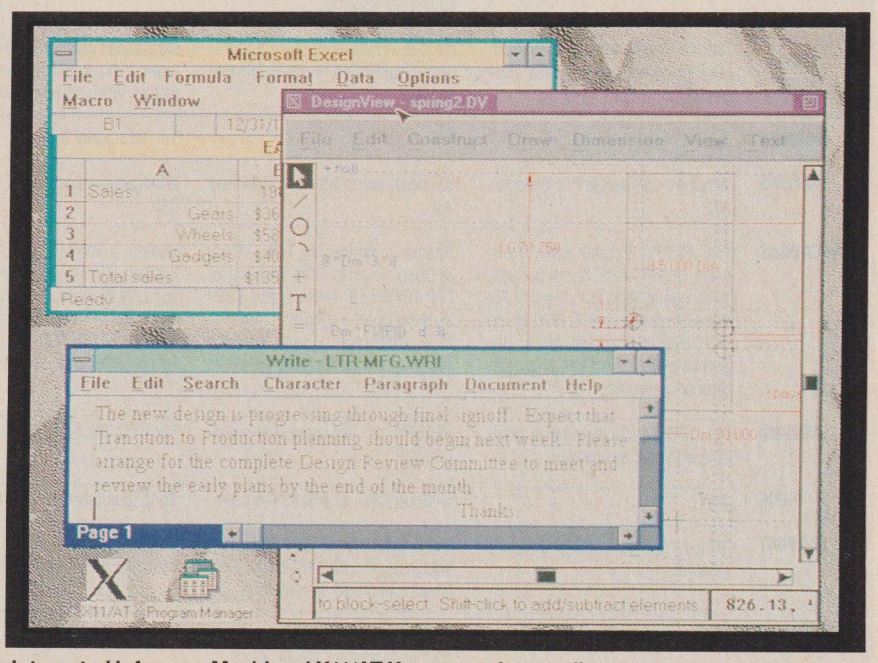
A Microsoft Windows X server allows Windows applications and X Windows applications to display simultaneously on a PC. An X server reverses the relationship DOS users expect in this situation. The UNIX host provides the clients (in this case, X applications). The PC is the server–directing the X application on the network, controlling the size and placement of windows on the PC, and smoothing out conflicts between Microsoft Windows and X Windows. The X server's job is to make it appear as if everything is happening on one machine.

Why an X Server?

Why even consider an X server for Windows? One good reason is to access the new UNIX network down the hall. If you already have a large installed base of PCs, it makes sense to use the equipment you have on hand. Linking a PC to a UNIX network via X server software will set you back about $1,000 per PC, including the network card and software. It's a bargain when compared to the cost of a workstation or even a color X terminal.

A second reason to use an X server, rather than an X terminal or UNIX workstation, is the flexibility you gain when using PCs as X terminals. A 386SX PC in tandem with an X server is comparable to midrange X terminals in performance and cost, yet leaves the user far more application options with DOS, Windows, and UNIX X clients available on a single machine. You get a multiple fold increase in software applications at a lower cost.

continued



Integrated Inference Machines' X11/AT X server software allows users to run X Windows under Microsoft Windows–at a price considerably lower than that of an X terminal.

A Tight Race

Our first round-up of X servers placed XVision as the program to beat. X11/AT, from IIM, has done just that. Superior installation routines, more window management options, and excellent performance and compatibility make X11/AT the best of the bunch. Even so, the three products are surprisingly similar. You can run multiple X applications in a single Microsoft Windows window or run each X client in a separate window exactly as you would run a normal X Windows application. You can cut and paste text from X to Windows and vice versa.

Most of the differences relate more to user preferences than to pure functionality issues. For example, X11/AT can run X applications using a remote window manager such a Motif in a multiple window mode, something the other products don't do. Installation, font management, and configuration options work differently in each program. Given the subtlety of the variances, you're not likely to go wrong with any of these packages.

We tested each product in two configurations. In the initial setup, a 386 20-MHz PC acted as the X server. The host was a Sun-4 running Motif from X Palm Inc. Video resolution on the 20-MHz box was 1024-by-768 pixels using a Texas Instruments Graphics Architecture (TIGA) graphics board and an IBM 8514/a monitor. The second configuration consisted of a 386 16-MHz PC connected to an AT&T 6386 PC running The Santa Cruz Operation's Open Desktop with VGA resolution provided via a Video 7 card and a NEC Multisync II monitor. Thin Ethernet (10Base5) served as the physical connection with FTP Software's FTP TCP/IP software providing the network link-up in both cases. All of the products support a variety of TCP/IP products including Wollongong, Sun PC-NFS, and Excelan.

Every X server requires a Microsoft Windows based PC. Effectively, this is a 386 with four megabytes of RAM, 40-megabyte hard disk, VGA monitor, and mouse. An Ethernet adapter and TCP/IP software are necessary to complete the picture.

Review Highlights

	X11/AT	XVision	HCL-Exceed/W
CONTACT INFO	*Integrated Inference Machines* Computer Products Division 1468 E. Katella Ave. Anaheim, CA 92805 714-978-6776	*Visionware Ltd.* 57 Cardigan Ln. Leeds, UK LS4 2LE 44-532-788-858 **vware@visionware.co.uk** **U.S. Distributor** *UniPress Software* 2025 Lincoln Hwy. Edison, NJ 08817 201-985-8000 or 800-222-0550	Hummingbird Communications Ltd. 2900 John St., Unit 4 Markham, Ontario, CAN L3R 5G3 416-470-1203
⊕	Three window modes. Easy to install and set up. Text and graphics clipboard support. File transfer utility. Strong performance.	Excellent configuration and setup access. Multiple draw options for improved performance. Excellent documentation. Large number of supported networks.	Large number of configuration options. Seven different start-up methods. DOS-based sister product.
⊖	Too many release notes in manual. Limited number of networks supported.	No X-to-Windows graphics cut-and-paste. Installation is not automated enough.	DOS-based installation and configuration. Noticeably slower performance. Weak documentation.
VERSION	3.2	4.0	1.0 Patch Level 3.
SYSTEMS	Windows-compatible PC, Windows 3.0.	Windows-compatible PC, Windows 3.0.	Windows-compatible PC, Windows 3.0.
NETWORKS	FTP TCP/IP, Excelan LAN Workplace, Sun PC-NFS, 3Com 3+Open, Wollongong WIN/TCP, Novell LAN Workplace, Beame & Whiteside TCP, Hewlett-Packard ARPA, Ungermann-Bass Net/One, and dual-protocol networks.	Beame & Whiteside TCP, 3Com 3+Open, Excelan LAN Workplace, FTP TCP/IP, HP ARPA, Locus TCP/IP, Novell LAN Workplace, Sun PC-NFS, Ungermann-Bass Net/One TCP/PC, and Wollongong WIN/TCP.	Beame & Whiteside TCP, 3Com 3+Open, FTP TCP/IP, HP ARPA, Novell LAN Workplace, Locus TCP for DOS, Sun PC-NFS, Ungermann-Bass NET/ONE TCP-PC, and Wollongong PathWay.
LICENSING	Per CPU. Multiuser version available with floating license.	Per CPU, per five users, and site licensing.	Per CPU, site licensing available.
PRICE	$495.	$449 per CPU, $1,810 for five users.	$545. Quantity discounts available.
SUPPORT	10 a.m. to 8 p.m. (EST). Quarterly newsletter.	9 a.m. to 5 p.m. (EST), Unipress provides support during installation. Continued support can be purchased.	9 a.m. to 7 p.m. (EST) Monday through Friday. Quarterly newsletter.
WARRANTY	90 days on media.	90 day warranty that it will work according to product specifications.	30 days on media.

X11/AT

X11/AT's installation is the easiest of the three products because it works through Windows, uses online help, allows all fonts to be installed, and can automatically make changes to the Windows files. The other two products fail to provide a comprehensive installation routine. Installation and setup are important in an X server because of the variety of options available.

Each product starts up by double clicking on the server icon within Microsoft Windows. X11/AT's main setup options can be accessed directly from the server icon. Selectable options include fonts, virtual screen size, and window mode. Some changes take effect immediately, but most require the server to be restarted.

Hiding the network and server issues from the user makes sense in an X server. Each product provides the ability to launch X applications directly from an icon. X11/AT's mechanism to start X clients, dubbed "Launch," requires the login, password, and host commands to be listed on a command line within the Program Manager. The Program Manager is Microsoft's poor-man's desktop. Because the Program Manager only allows 60 characters on the command line, a batch file in DOS or script in UNIX is often necessary to complete a wordy login process.

X11/AT supports graphics cut and paste in addition to text transfers. All cut-and-paste images are retrieved from the Windows clipboard and the cut-and-paste func-

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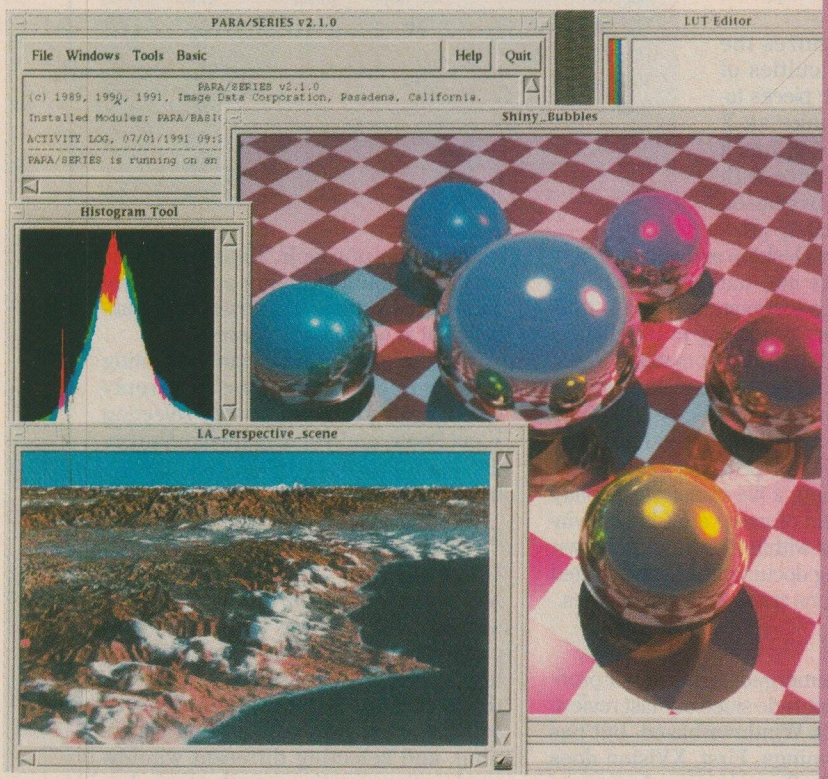

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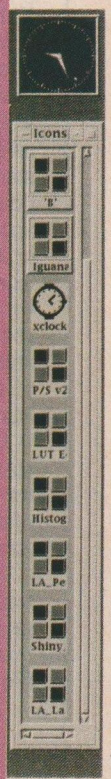

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tion works well. We brought a bitmapped drawing and a vector-based image from FrameMaker into PC Paintbrush. The images transferred perfectly and could be edited, filled, and altered within PC Paintbrush.

Managing Windows

One feature in which X11/AT stands above the other products is in its window manager implementation. As in all three products, X11/AT allows X clients to operate exactly like Windows applications. However, instead of only offering a single large X window in which X clients operate under a remote window manager, X11/AT supports a multiwindow mode.

In the multiwindow mode, you can choose a window manager on the host from within an **xterm** window. You can select Motif, or any other manager provided as part of X, such as **twm** or **uwm**. Once started, every X client uses the host window manager while Microsoft Windows applications use the local window manager. All applications can be moved, sized, or iconified even though there are two active window managers on the screen. Using a remote window manager, such as Motif, adds traffic to the network, so you are best off using the local window manager under Microsoft Windows.

Like the other two products, X11/AT supports 256 colors on the 8514 monitor with the TIGA graphics board. All of the X color classes are supported by each product.

IIM is the only vendor to provide file transfer facilities and does so through a utility called Wftpserve. Assuming the host has the client implementation of the file transfer protocol, the process works simply: Start the server on the PC side and then connect to the host via Telnet; from the host side, an **ftp** command is given; and file transfer is accomplished with "Get" and "Put" commands. HCL-Exceed/W and XVision 4.0 rely on the network software or require the purchase of separate programs to accomplish file transfers.

All of the products support 256 colors and all of the X color classes

X11/AT's thorough and well-documented manual suffers from the inclusion of a huge pile of release notes, but IIM is revising the documentation. The only problem we had with X11/AT was the ability to hang the server when the **ico** program was switched off via the window manager. No other clients caused X11/AT a problem.

IIM recognizes the various difficulties of getting all the pieces together to make an X server work. It has a strategic alliance with JSB's Windows-based UNIX connectivity product Multiview Desktop and supplies bundled software and hardware–network cards, graphics accelerators, and PCs–to allow customers the ability to purchase a turnkey Windows to UNIX system.

IIM's X11/AT gets high marks for ease of installation and simplicity. The Windows-based installation is smooth and thorough. X11/AT provides a number of extras including a file transfer capability and the option of using an X-based window manager within individual windows. The confusing documentation and limited network options are its only weaknesses.

XVision 4.0

XVision has emerged as a stronger product after an upgrade since our last review. Installation is Windows-based, but has two shortcomings. First, XVision does not automatically make any changes to the system files, including **win.ini** and **autoexec.bat**., resulting in much manual reading and a 45-minute call to England to find out what parameters we were missing in our setup. Second, there is no online help during installation and because installation is an essential part of using an X server, online context-sensitive help is sorely missed.

X clients are launched through XVision's Program Starter. Clicking on the Program Starter icon pops up a dialog box for input of the desired settings including host address or name, login, password, and a UNIX X client command line. After completing the form, you save the settings in a file and create an icon in the Program Manager. When selected, the icon calls the settings file with the **xps** command, which is a better method than X11/AT's straight command-line approach. Like the other products, double-clicking on the newly created icon starts the server automatically if it is not already running.

XVision provides two handy auditing tools: you can display the host reply when logging on to the host by selecting View Reply, and you can invoke the entire login process in a sequential step-by-step mode for debugging purposes.

Setting Up the Serve

Unlike Exceed/W, but similar to X11/AT, XVision can be set up directly from the server icon. Clicking on the icon and choosing "Preferences" pops up a dialog box with the setting options. Options include altering the X color scheme, changing the keyboard mapping, and selecting different window modes. Some options, such as window mode and font selection, are activated only after the server restarts. XVision's Preference menu is the most convenient of all three products.

As in the other products, the entire X world occupies one Microsoft window in XVision's single-window mode. This window contains all the active X applications with each X client operating in its own window. While the overall X window uses the Microsoft window manager, individual X clients use whatever window manager is chosen in X–which could be Motif or Open Look. An X window within the larger Microsoft Window can be sized, moved, or iconified within the borders of its parent window.

XVision's second mode is called Multiple-Window. Here, each X client operates in its own window under the Microsoft window manager. As with its competi-

X Server Features Table

Feature	XVision	X11/AT	HCL-Exceed/W
Windows-based Installation	Partial	Automatic	No
Telnet Utility	Yes	Yes	Yes
Windows-Based Options Menu	Yes	Yes	Some
Options Adjustable on-the-fly	Yes	Some	No
Window Manager Modes	2	3	2
# of supported Networks	10	9	9
Support	3rd Party	Direct	Direct
File Transfer	No	Yes	No
DOS-based sister product	No	No	Yes
Graphics Cut & Paste	No	Yes	Yes
256 Colors	Yes	Yes	Yes
Auto Launch Facility	Yes	Yes	Yes

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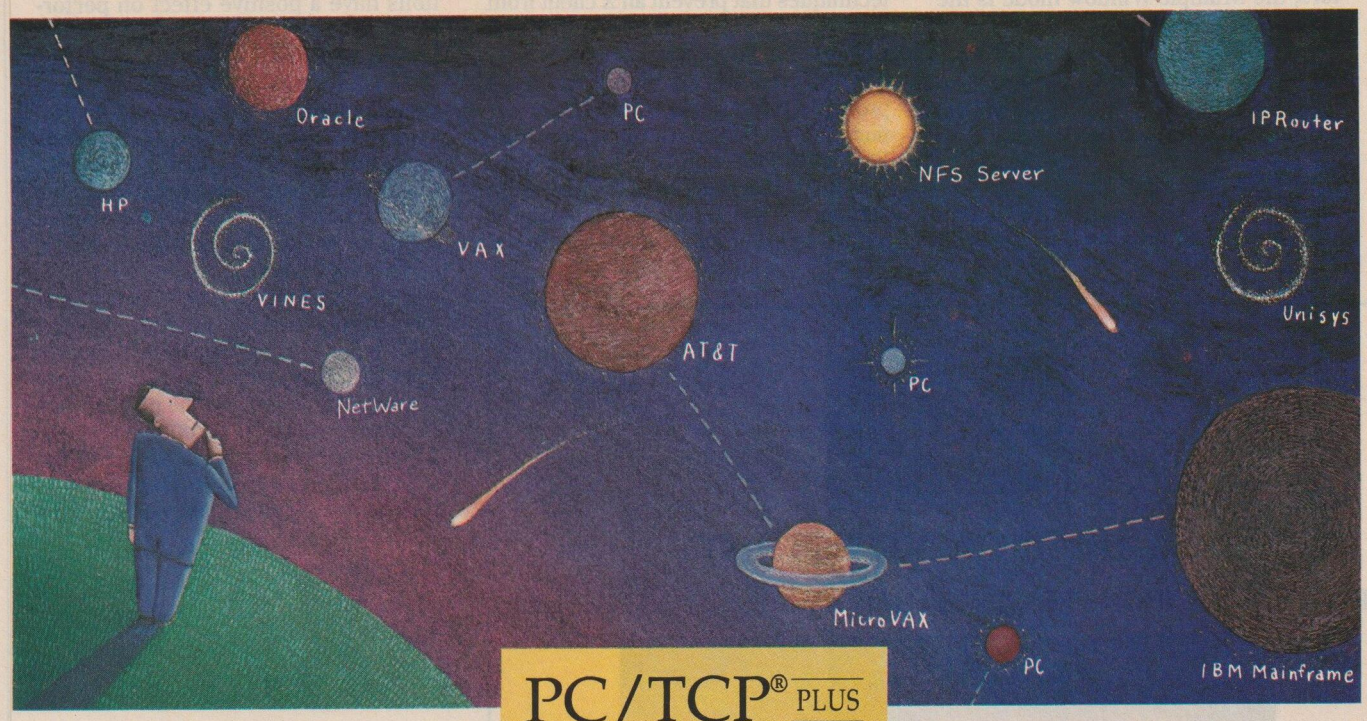

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tors, the Multiple-Window mode is the most sensible mode of operation and because X servers turn an entire PC screen into an X application, XVision allows you to choose between a Windows and an X background.

Reducing the Workload

All three products support Save Unders and Backing Store which are simple techniques that prevent an X client from redrawing every window on the PC whenever a single window is changed. XVision goes beyond these features to provide specific performance tuning options. Three settings in the option box–Fast, Standard, and Correct–regulate how the server uses fonts to redraw the screen. Similar in concept to preview modes in other applications, these options have a positive effect on performance. The drawing modes can be altered on the fly.

XVision does not directly support graphics cut-and-paste from X to Microsoft Windows, but text can go both ways. Inherent in Microsoft Windows is the ability to use <Alt-PrintScreen> to capture an entire window into the clipboard for any X window client running under an X server.

X Display Management Control Protocol is supported by all three servers (you have to request a free upgrade from IIM). The idea is similar for each product: if operating on the host, an **xdm** display manager will communicate with XVision when the XVision server is started. If local **xdm** is enabled, XVision selects the display manager, the **xdm** will, in turn, ask for a login and then execute the **.xsession** file to load the specified clients. The **.xsession** file acts in a manner similar to a **.login** in UNIX by setting up the environment.

XVision 4.0 has corrected any problems found in earlier versions

XVision provides two separate manuals that reflect how the installation process is structured. The *Communications Guide* outlines how to make Visionware products operate in a network. Each supported network takes a few paragraphs of special instructions in addition to the general information. The *Users Guide* is particular to XVision. A well-illustrated guide, it describes setting up the server, using the program starter, running Microsoft Windows and includes a good explanation of X Windows in the appendix.

Version 4.0 of XVision has corrected any problems that were found in earlier versions. The option to change settings on the fly, while the server is running, is a real plus. The three drawing modes give the user control of the performance vs. quality issue. XVision comes with all the features you expect in an X server with the exception of graphics cut-and-paste and simplified installation.

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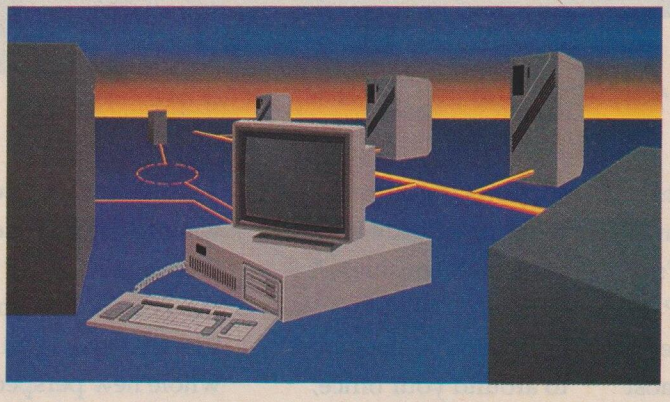

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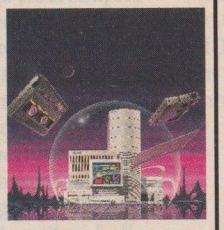

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CIRCLE NO. 79 ON INQUIRY CARD

Hummingbird's HCL-Exceed/W

HCL-Exceed/W evolved from Hummingbird's DOS-based X server. Recognizing the advantages of tying X and Windows together, they converted their DOS X server to Windows. Generally well done, traces of DOS show in the install and set-up routines of the server.

HCL-Exceed/W was the most difficult program to install for three reasons. First, it must be installed from DOS. Second, while the installation handles changes in the **autoexec.bat** file, you have to create all the Windows icons and program groups manually. Third, a DOS-based utility called **Xconfigp** needs to be run and configured to properly run HCL-Exceed/W. **Xconfigp** is a long and involved install procedure left over from Hummingbird's DOS server. The entire process takes longer than it should. Hummingbird promises Windows-based installation, configuration, and online help in the next scheduled release. On the plus side, the set up is thoroughly and clearly explained in the manual.

Hummingbird provides some set-up options within the server icon once the server is running. Switching between single and multiple window modes can be done without returning to **Xconfigp**. You can reload font and color databases that were originally mapped and compiled in **Xconfigp**. User preferences–such as how the <Alt> key responds, whether to show scroll bars in single window mode and whether to give a warning when exiting the server–represent a sample of the eight online options available.

Fonts and Color

The **Xconfigp** program is where color and fonts are set and adjusted. A font compiler lets you use any standard font by recompiling it in .BDF format. A log file captures all the messages from the host and can be read by an editor for debugging. You can even take a "font missing" error message from the log file, move the font name to the font database, and set up an alias so the font works correctly.

Like X11/AT, both graphics and text can be cut and pasted from Windows to X. Choosing the Edit, Copy, and Rectangle commands within the control box of any X application changes the cursor into a camera to be used to select the size of the image capture. You can also capture the entire window by choosing the "All" option. HCL-Exceed/W brings in both the bitmap and the palette if your Windows driver supports more than 20 colors.

Hummingbird's facility to automatically start an X client is labeled "Xstart." Clicking on the Xstart icon in the program group brings up a dialog box with fill-in boxes for user identification, password, password verification, and a command field. The name of the host and the time-out values are also selectable. You can choose to store the password in an encrypted format or have the program prompt for it. You then create Windows icons that refer to the Xstart settings. Each of the three products attempts to shield the user from the coarseness of networks and UNIX command lines through automatic client start-ups. HCL-Exceed/W is the only reviewed product to encrypt passwords on the PC side.

HCL-Exceed/W follows XVision's model of window management and allows independent applications to run under the Microsoft Windows window manager. However, to use Motif or an-

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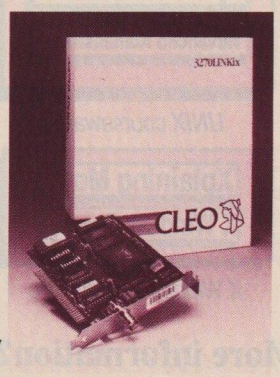

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other X-based window manager within HCL-Exceed/W, X clients have to run in Single Window mode which is neither particularly attractive nor functional in any of the reviewed products. Single window mode makes the screen seem out of kilter, increases network traffic, and prevents the individual X client from being iconified on the Windows screen. IIM's implementation of multiple window managers is far more usable and smooth if you want to use Motif.

The Key to Success

HCL-Exceed/W supports complete keyboard mapping. We encountered keyboard inconsistencies with the delete key and certain FrameMaker options, but remapping the keyboard solves this type of problem. HCL-Exceed/W also provides a full set of European keyboard maps selectable in `Xconfigp`.

Testing for performance variations produced two interesting facts. When the Backing Store and Save Unders features were disabled, all three products were similar in performance. HCL-Exceed/W was visibly slower with scrolling actions, but the difference was minimal on a small network. With Backing Store enabled, XVision and X11/AT remained consistent in performance. HCL-Exceed/W's performance dropped off noticeably. While the vendor had no explanation for this drop in performance, you would typically not use Backing Store because of the quickly changing nature of graphical applications.

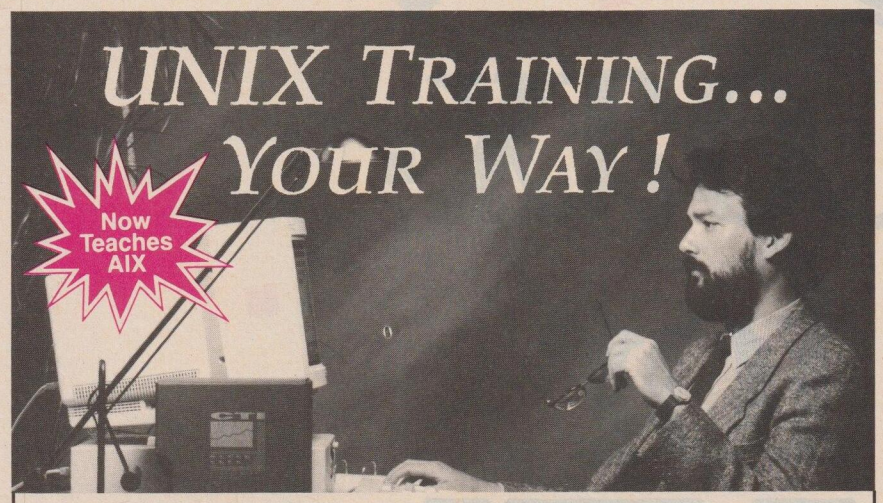
Because of its tie to the DOS versions of Exceed, the UNIX documentation is not up to par. The product comes with DOS and Windows manuals–at first, we thought they inadvertently sent us an extra manual. There are occasional references to the DOS manual within the Windows manual. The Windows manual does not contain even a token screen shot of HCL-Exceed/W running under Windows. Hummingbird says they will issue new documentation soon. On the other hand, Hummingbird is the only vendor with both DOS- and Windows-based X server products, which is attractive to corporations running both operating systems.

Three to Go

The Microsoft Windows X servers reviewed here resemble three peas in a pod. Each includes a Telnet connection utility and two different ways to display X clients, 256 colors, and cut and paste. Performance is nearly identical on many routine tasks. All three products are easy to operate and do what they claim in a networked environment.

Most of the differences relate to the technical implementation of features or how certain set-up options are configured. HCL-Exceed/W complements its sister product in DOS and supplies excellent font support. XVision wows the user with on-the-fly preferences and a large number of supported networks. X11/AT stands ahead of the crowd due to its ease of installation, three window modes, and high degree of compatibility.

Each product will find a place in the market due to the strength of Windows, the savings over purchasing X terminals, and the fact that using 386 PCs as X terminals significantly increases your options. The advantages of X terminals have been seriously disrupted by this trio of Microsoft Windows X servers. ■



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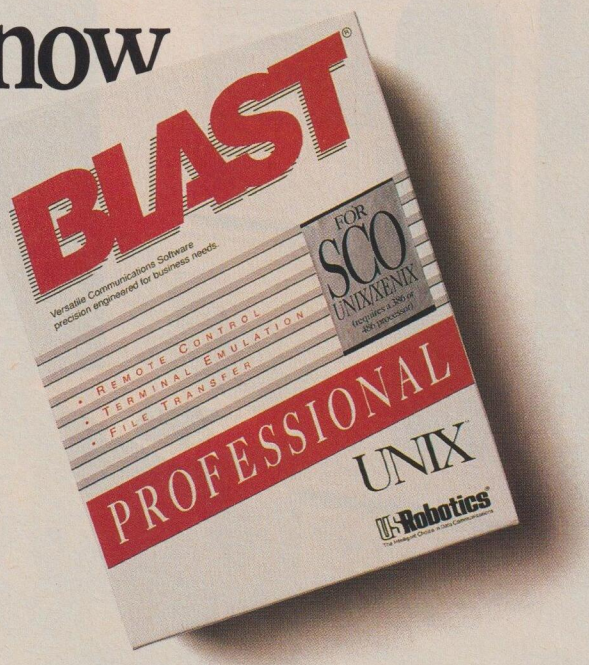

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CIRCLE NO. 54 ON INQUIRY CARD

UNIX Mail Gets Easier

By Rick Farris

Yes, e-mail is wonderful and thanks to some new programs, we might find out how wonderful

Sooner or later, everyone who uses UNIX uses their system's mail program to communicate with other folks. Sometimes its with people in the same office, but most of the time it's across UUCP connections to other cities. Now, thanks to some enterprising vendors, using e-mail is easier for the UNIX masses, wherever they are.

The two standard UNIX mail programs–**Mail** on BSD systems and **mailx** on System V–have improved over the years. They're still command- and flag-driven, but if you're willing to deal with ponderous error messages like "Need -f with -I flag," you can tough it out with the system mailer. If you don't want to, this review looks at three e-mail packages that replace the system mailer and make your life, well, more modern.

The three products are Cymail from Cyantic Systems, Poste from Alfalfa Software, and Z-Mail from Siren Software. A fourth product, VMail from FutureWare (Rolling Meadows, Ill.), that didn't arrive in time for our review offers the basic features–namely, a modern interface, real help text, and an easy way to select, display, and forward incoming mail messages. In addition, Applix announced at publication time that it intends to begin shipping a mail program based on its Asterix office automation package.

Of the three review products, Z-Mail is the feature-leader with an interface for any kind of display–it even works with an archaic teletypewriter–and almost universal configurability. Poste works only with X Windows and comes preconfigured for most applications. Cymail is **curses**-based, so it will run on text-only terminals, and at $145 per CPU, it's affordable to all. The unreviewed VMail starts at $295 per CPU.

We tested these mailers on a 386-based host running The Santa Cruz Operation's Open Desktop on a network with other SCO-based hosts and a Tatung SPARC workstation. Interestingly enough, the Tatung comes with a SunView version of Z-Mail 1.0 as standard equipment.

Desirable Features

An ideal mailer should show the headers of the messages in your mailbox and allow you to use the cursor keys or mouse to select messages for reading. Further, if you have more messages in your mailbox than will fit on one screen, you should be able to sort them so that all the messages from "johnm" or all the messages received today, for example, appear first.

Once you've read your mail, you may want to save it for future reference. We keep mail from frequent correspondents in *folders* named after the sender. Z-Mail automatically stores a copy of our

Siren Software's Z-Mail has features that allow users to sort and search mail messages, as well as add custom features with a script language.

outgoing e-mail in the appropriate folder so we can go back later and reread both sides of an exchange. Cymail and Poste lack this feature, but you can simulate it by sending carbon copies to yourself.

Over time, your folders begin to swell with files, so you need a way to query archived messages by keywords, restrictions on the sender, or perhaps the date of the desired message. Poste and Z-Mail answer this need with convenient ways to move messages from folder to folder and cross-reference messages.

When composing mail, it's handy to have *aliases* that save typing by allowing you to use nicknames that are later expanded into the longer address required by the mail transport agent. If you're used to a particular editor, like **emacs**, **vi**, or even WordPerfect, your mailer should let you access that editor to compose messages. Cymail and Poste also provide built-in editors, which operate like simple word processors.

What if you'd like to append a spreadsheet, fax an image, or add any other type of binary file to the end of your message? Poste, Z-Mail, and Cymail each include ways to process *enclosures*. Generally, the files are encoded on the sending end and then decoded by the receiver. Poste and Z-Mail include information in the file that will automatically start up the proper viewing program–FrameMaker or **xloadimage**, for instance.

Z-Mail

If you're a heavy e-mail user and you don't use the system mailer, it's likely that you use "Mail User's Shell," usually called **Mush**. A shareware program, **Mush** became so popular that its authors, Dan Heller and Bart Schaefer, formed a company to produce Z-Mail, essentially an enhanced version of **Mush**. Mush has been in widespread use since 1985 and, in its seventh rendition, works almost flawlessly. Z-Mail, a superset of Mush, shows the six years of refinement.

As an X Windows product, Z-Mail has many easy-to-use features. In its default configuration, it has a row of buttons with common mail operations–such as read, delete, save, and compose–accessible via mouse-click. Z-Mail is so configurable that you can create your own buttons for your most frequently used commands. For instance, we have **forward**, **bounce**, and **update** on our buttons.

Z-Mail is replete with scrollbars, pushbuttons, sashes, radio boxes, and all of the other Motif widgets. These window decorations are put to good use simplifying your interaction with the underlying UNIX mail system. Message headers are presented in a window and can be selected singly or in groups with the cursor keys or mouse. Reading a message can be as easy as double-clicking on it with the mouse.

Z-Mail's X interface is flashy, but it is useless on a character-based terminal. Luckily, Z-Mail includes a full-screen **curses** mode and if you're using a terminal not supported by **curses**, or you're connected via a slow modem, Z-Mail has a strictly text-based scrolling mode.

Z-Mail provides a script language (for eternal hackers) and hooks to accommodate your own C or shell script functions. As a programming example, the authors provide a "bounce" function that lets you readdress a message that has been rejected because of a bad e-mail address.

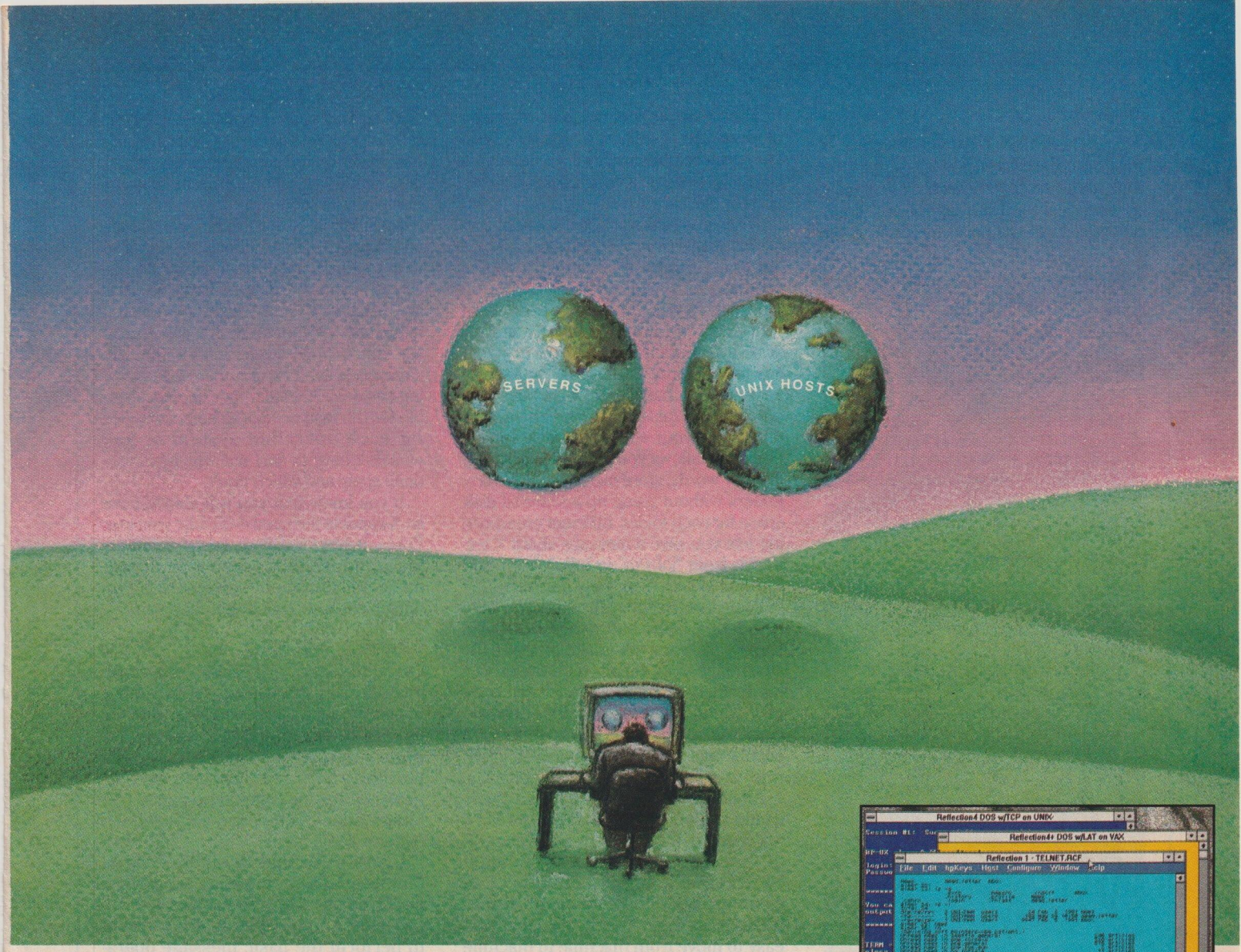
Documentation for Z-Mail consists of a 100-page user's guide and a 200-page reference manual formatted as a standard UNIX **man** page. Also available is the book, *The Z-Mail Handbook*, by Hanna Nelson from O'Reilly & Associates, which provides tutorials and explanations of typical patterns of usage from a third-party viewpoint.

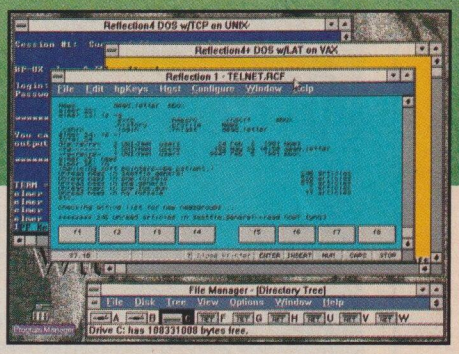
Installation of Z-Mail went smoothly. It was the only package reviewed that used the preferred SCO **custom** installation package. We like **custom** because it takes care of the details of file locations and permissions without our intervention. Z-Mail is the most flexible of all the packages tested: it will work on any hardware, and can even be configured to emulate **mailx**. Its script language means that you can extend it to do things that the authors didn't envision.

continued

Review Highlights

	Z-Mail	Poste	Cymail
CONTACT INFO	*Siren Software Corp.* 750 Menlo Ave., Ste. 200 Menlo Park, CA 94025 415-322-0600 or 800-457-4736 **uunet!siren!info**	*Alfalfa Software Inc.* 185 Alewife Brook Pkwy., Ste. 4200 Cambridge, MA 02138 617-497-2922 **uunet!alfalfa!info**	*Cyantic Systems* 24 Mabelle Ave., Ste. 3309 Etobicoke, Ontario Canada M9A 4X8 416-234-9048 **uunet!utzoo!infodes!cyminfo**
⊕	Works on any terminal. Has a script language and has high-quality, third-party documentation available.	Good folder handling. Well thought-out interface. Integrated network support.	Great price. Easy to use. Small. Poor folder handling. No sort facility.
⊖	Some documentation is only available at extra cost. Slightly awkward folder handling.	No text-mode interface. Complex installation procedure.	Operating system software is a minor revision behind the current SunOS version. Tatung doesn't have as large a support network as Sun.
VERSION	2.0	1.0	1.2
SYSTEMS	Sun-3 and -4, SPARC, SCO UNIX and Open Desktop, DEC RISC and Ultrix, MIPS, Pyramid, Motorola 88000, Apple A/UX, Sequent, and Data General Aviion.	SunOS 4.1, SCO UNIX Open Desktop 1.1, IBM RISC/OS 4.5.1 and RS/6000, Sony News, DEC Ultrix 4.0, HP-UX, and X11R3 or later.	386 UNIX, SPARC workstations.
LICENSING	Per user.	Per concurrent user, floating license.	Per CPU.
PRICE	$295 single-user; $1,395 for five users; $2,495 for 10 users. Prices include user and reference guides for each user. Site licensing and discounts available.	$395 for single-user; $1,750 for five users; $2,950 for 10 users; and $5,950 for 25 users.	$145 per CPU. Extra user manuals available for $7.50 each.
SUPPORT	Noon to 8 p.m. EST, toll-free number. Yearly support contract: $75 for a single-user license, 15 percent of license fee for multiuser licenses. Includes minor updates and revisions. E-mail support at **uunet!siren!support.**	8 a.m. to 5 p.m. EST non-toll-free. E-mail support at **uunet!alfalfa!support.**	180 days free, non-toll-free number.
WARRANTY	90 days on media.	90 days on media.	90 days on media.





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CIRCLE NO. 125 ON INQUIRY CARD

Poste

Poste's tasteful X Windows interface is an immediate attention grabber. One look at the screen shows that an artistic person designed the layout and color scheme. Even the program's icon–a Labrador retriever that holds an envelope in his mouth when new mail is received–shows incredible attention to detail: his coat is yellow, he's wearing a red collar, and his eyes are blue.

When you first start Poste, you're presented with a two-part window that has a list of messages in the upper half. As soon as you select a message with the mouse, its text is displayed in the bottom half of the window. Clicking on successive messages displays them, along with any attachments. Poste is the only product reviewed that allows you to have folders inside of folders, which is handy for organizing your e-mail into a hierarchy. Poste also allows you to "link" messages, in other words, store messages in several folders without using up additional disk space for each folder. Efficient crossposting lets you save a message about X terminals from "johnm" in July, johnm, and X terminal folders for easy reference.

Poste has exceptional support for nontext data. Click a button and Poste will happily display a fax image or a **gif** file attached to your e-mail. With the proper hardware configuration, Poste can even play sound files–multimedia, here we come. Poste also has X.400 support–a popular mail interchange standard in Europe–available as an extra-cost option.

Alfalfa Software assumed that Poste would run on a network, and therefore designed it with a client-server architecture. Poste's server can run on a centralized gateway computer and communicate with Poste clients distributed across the network. This makes it easy to move from machine to machine and not have interruptions in your mail. It also allows Poste to maintain "group message stores" that act in a manner similar to an electronic bulletin board.

X Windows, one of Poste's strong points, is also its weak point. Without X Windows you can't have Poste, so if most of the users on your system have ASCII terminals, Poste is probably not a wise choice. Also, if you intend to run Poste's client and server processes on the same computer, Poste easily gobbles up about 2 1/2 megabytes of RAM, whether you're running mail or not.

Poste's 200-page user's guide is a well-written task-oriented document with a complete table of contents and index. Online help is complete and an online tutorial is included. It's refreshing to note that Alfalfa includes a list of known bugs in the Poste release notes.

Installation is not for the faint-hearted–12 pages of instructions are required to copy Poste from the distribution diskettes to your hard drive. Once the files are installed, 20 more pages are devoted to the initial setup. To be fair, one reason the instructions are so long is that the same set is used for all supported operating systems. It would have been preferable for the instructions to be customized for each operating system so you wouldn't have to sort out which instructions apply and which don't.

If you know that you will always have an X-capable terminal available, consider Poste–it has excellent folder management and the best support for attachments of any product reviewed. If you don't have X, though, keep shopping.

Cymail

Cyantic Systems makes no bones about the fact that Cymail is not a full-featured behemoth like Z-Mail or Poste. But, for only $145 per computer (Z-Mail and Poste cost more for each user), Cymail provides a full-screen interface, an easy-to-use editor for composing messages, binary attachments, and rudimentary folder management.

Cymail's user interface is designed so that necessary commands are always displayed on-screen. In the message entry mode, a Lotus-style menu allows you to perform the basic message operations. By default, message headers are displayed in a window near the top of the screen, and the body of the current mes-

A Glossary of E-mail Terms

alias A short form of an e-mail address. For instance, instead of typing **uunet!foo!bar!blah!johnm**, you could create an alias so that all mail addressed to **jm** was automatically expanded to the longer form.

curses A method of creating programs that allows text-only terminals to have a full-screen interface.

emacs Editing Macros, a common freeware UNIX editor.

enclosure When used with e-mail, it means a binary file, like a program, fax image, or word processor file that couldn't normally be sent via e-mail.

folder A file or directory for archiving e-mail. Typically, a folder is kept for mail to-from a certain user, or for mail received in a given time period.

gif Graphics Interchange Format, a format for storing picture bitmaps.

MTA Mail Transport Agent, the part of the mail software that runs behind the scenes to deliver mail.

MUA Mail User Agent, the part of the mail software that the user interacts with to retrieve, display, compose, and archive e-mail messages.

SMTP Simple Mail Transport Protocol, a popular method for delivering mail across TCP/IP networks.

uudecode A common UNIX program that takes a file that has been *uuencoded* and converts it back into the original format.

uuencode A common UNIX program that converts an eight-bit data file (see *enclosure*) into a seven-bit file, which is the required format for transfer over the e-mail network.

vi The default UNIX editor

X The X Window System, in combination with Motif, that provides a graphical user interface.

X.400 An Open Systems Interconnection standard mail and messaging protocol.

xloadimage A freely available program that displays graphical data–such as fax images or bitmapped **gif** files–in an X window.

Know Your E-mail Features

Feature	Z-Mail	Poste	Cymail
Built-in editor	Yes	Yes	Yes
Automatic forwarding	Yes	Yes	Yes
Point-and-click message selection	Yes	Yes	Yes*
Easily assembled mail groups	Yes	Yes	Yes
Multiuser security	Yes	Yes	Yes
Menu-driven	Yes	Yes	Yes
Print groups of messages	Yes	No	No
UNIX platforms supported	12	7	3
X Window System version	R3, R4	R3, R4	–
Folders inside folders	Yes	Yes	No
Search folders	Yes	Yes	No
Sort folders	Yes	Yes	No
Programming Language	Yes	No	No
Binary Attachments	Yes	Yes	Yes
Text Mode	Yes	No	Yes

* Does not use mouse.

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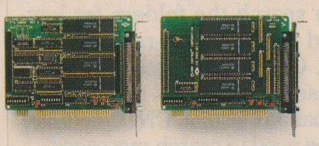

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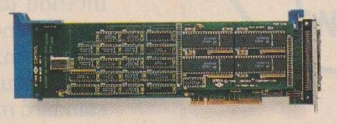
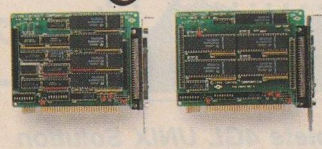
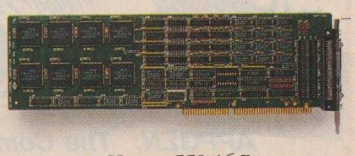


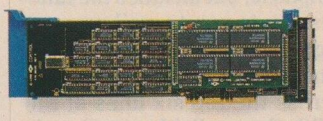
Hostess MC 4 or 8 Port Nonintelligent Serial Controller (MicroChannel)



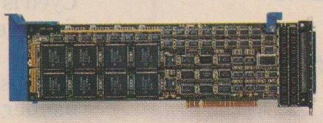
Hostess 550 4 and 8 Port Buffered Nonintelligent Serial Controller



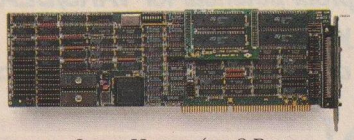
Hostess 550 16 Port Buffered Nonintelligent Serial Controller



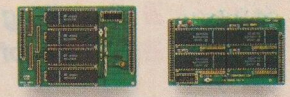
Hostess 550/MC 4 or 8 Port Buffered Nonintelligent Serial Controller (MicroChannel)



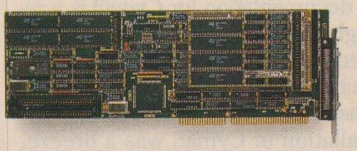
Hostess 550/MC 16 Port Buffered Nonintelligent Serial Controller



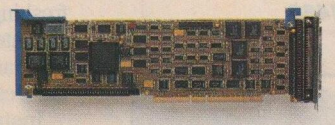
Smart Hostess 4 or 8 Port Intelligent Serial Controller



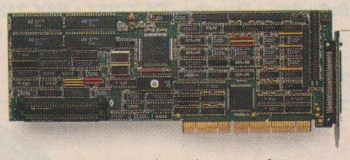
Hostess Series Upgrades Provides Growth from 4 to 8 Ports



Hostess i 8 or 16 Port Intelligent Serial Controller



Hostess i/MC 8 or 16 Port Intelligent Serial Controller (MicroChannel)



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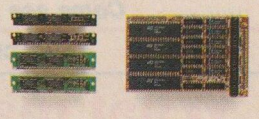
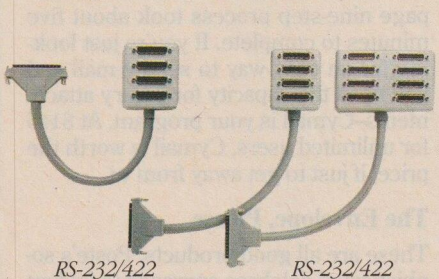
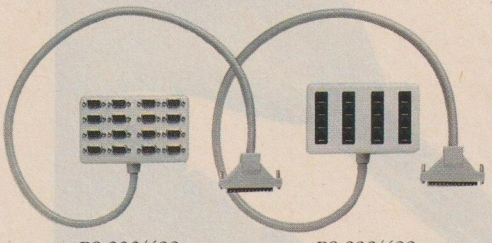


Hostess i Series Upgrades Memory and Port Upgrades



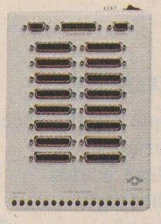
RS-232/422 25-pin Female (4 Port)

RS-232/422 25-pin Male (4 & 8 Port)



RS-232/422 9-pin Male (16 Port)

RS-232/422 RJ45 (16 Port)



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sage is displayed below it.

Like the other products reviewed, Cymail provides a menu of your incoming e-mail and lets you select the message to read. Unlike Poste and Z-Mail, Cymail presents the messages in the order they were received and doesn't allow you to reorder them. This is a pain if you have 100 messages waiting and you can't find the important one from your mother. Cymail implements a single-level folder scheme like Z-Mail and saves messages in folders that you designate, but has no method to search the folders for keywords, and cannot cross-reference or sort them. Cyantic Systems points out that because Cymail saves messages in standard mailbox format, UNIX tools like **grep** can be used to search messages.

Cyantic Systems is particularly proud of its integrated full-screen editor, Cyed. Cyed is simplistic, but includes the functions necessary to create mail messages. Its biggest feature is the menu, reminiscent of Wordstar, that runs like a banner across the top six lines of the screen. With the available commands listed in plain view, Cyed makes it impossible to go too far wrong.

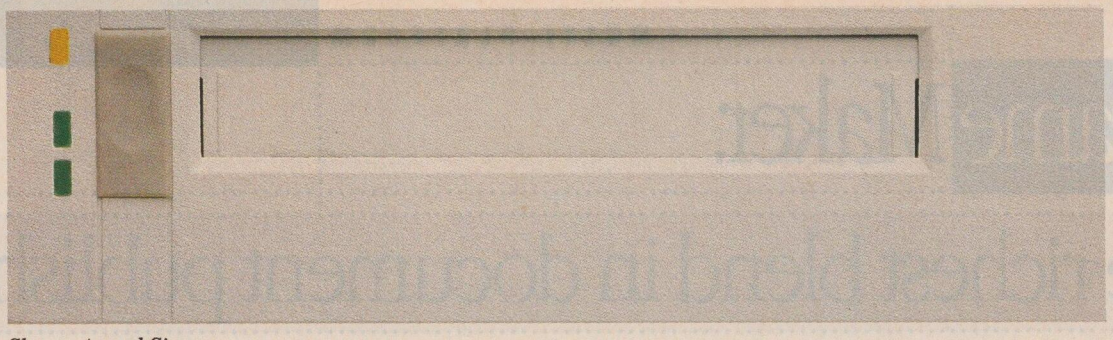
The documentation for Cymail is a refreshingly short 50 pages with a good table of contents and index. We liked the fact that the manual is a full 8 1/2-by-11 inches, making it easy to see screen illustrations.

Installation of Cymail was a breeze, despite the fact that the SCO standard **custom** command wasn't used. The one-page nine-step process took about five minutes to complete. If you're just looking for an easy way to send e-mail and you need the capacity for binary attachments–Cymail is your program. At $145 for unlimited users, Cymail is worth the price, if just to get away from **vi**.

The Envelope, Please

These are all good products: Poste's sophisticated database approach to folders is first-class and Cymail is a beginner's dream. The best bet, though, is Z-Mail because it can be used on any terminal from TTY through X terminals, has third-party documentation available, and has a script language–just a few reasons why it is *UNIXWORLD*'s editor's choice. But if your environment is solely X Windows, Poste deserves strong consideration, and with Cymail available for $145, no beginner should be forced to battle with **mailx**. ■

Editor-at-Large Rick Farris is a regular reviewer for UNIXWORLD *and a consultant working with high-tech companies in the San Diego, Calif. area. He can be reached on the Internet as* **rickf@uworld.com**



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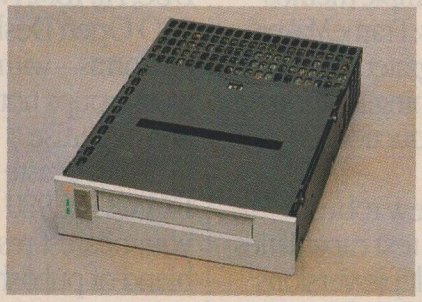

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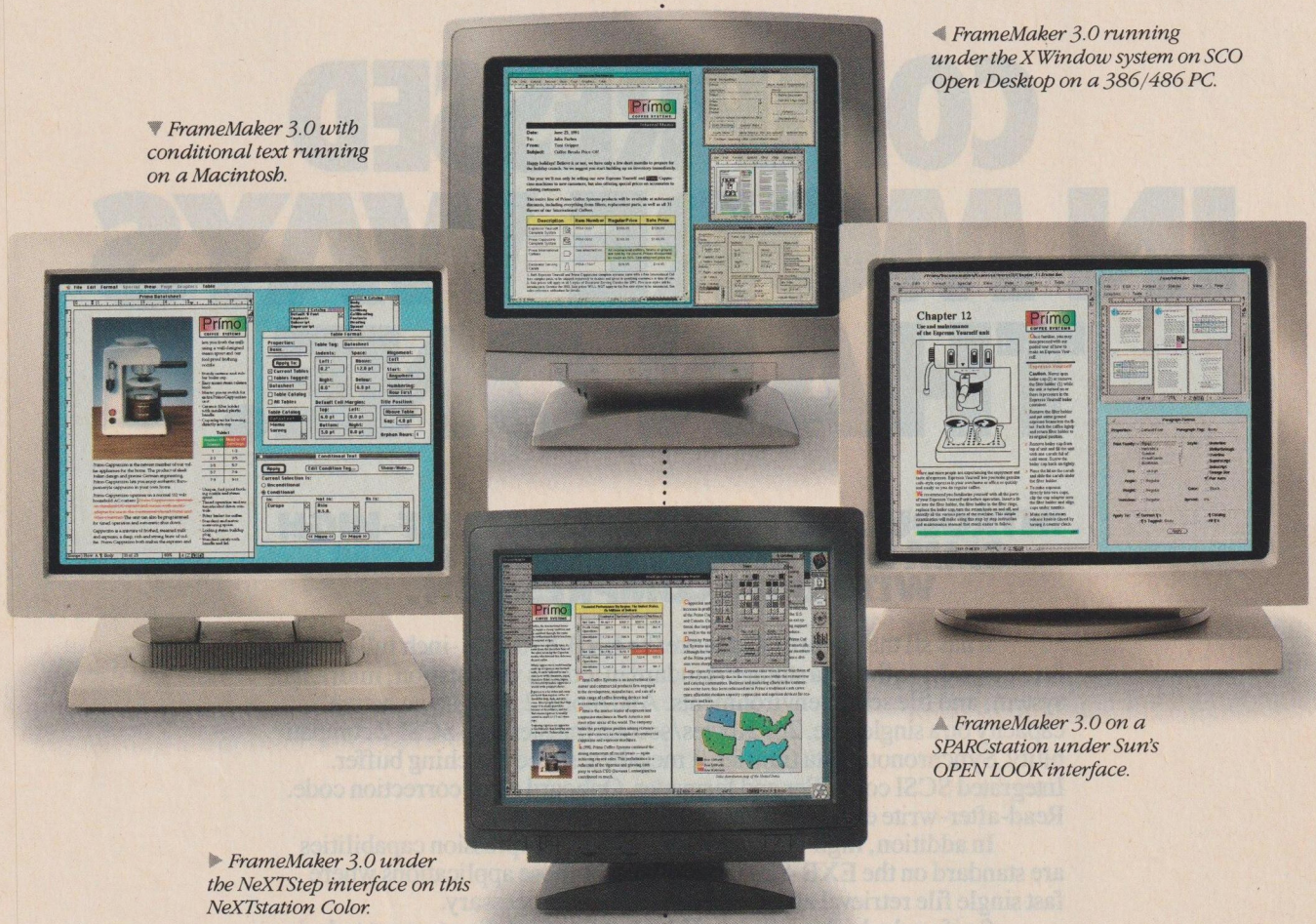

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CIRCLE NO. 224 ON INQUIRY CARD

Update by Frank Hayes

SQL Access Shows Database Interoperability

Can databases work together? Right now, the answer is generally no. If you have data in relational database systems from two or more vendors, you probably find it difficult to generate a report or otherwise utilize information taken from different databases. Although all database servers may meet official standards, they still won't interoperate.

Two years ago, the SQL Access Group, a coalition of relational database vendors that was determined to get their products working together decided to tackle the interoperability problem. Now they've finally made some progress. In July, the SQL Access Group demonstrated what it calls SQL Access Phase I, a new specification for SQL (Structured Query Language). To show that the new specification will allow users to mix and match applications and databases from different vendors, the group connected more than a dozen client workstations and database servers on a network. The client applications–including Microsoft Excel, Informix Wingz, Hewlett-Packard's NewWave Access, and several 4GLs–were each able to get data from database servers from Digital Equipment Corp., Fujitsu Ltd., HP, Oracle Corp., Sybase, Tandem Computers Inc., Teradata, and Unisys Corp.

Unfortunately, there are still plenty of problems impeding the progress of universal database interoperability. Some are historical, like the large installed base of databases and applications that don't match the new SQL standard. Others are limits of the new standard itself–limits that will have to be overcome before SQL Access can really get databases working together.

The Standard that Wasn't

The core of the new SQL Access standard is a new, tighter definition of SQL, the data request format used to obtain information from relational databases. SQL started life at IBM as the query language for IBM's mainframe relational database, DB2. With earlier database systems, a programmer had to know the structure of the database files to get information or add to it. With SQL, a programmer's application simply sent an SQL message to the database server that requested information by name, and the database server sent back that data in a return message. The SQL messages were the only connection between the application and the database, which made DB2 database applications a little easier for programmers to create–and much easier to maintain.

It didn't take long for relational database systems to become popular with users and database vendors outside of IBM. SQL became so popular that the American National Standards Institute (ANSI) adopted a version of SQL as a U.S. standard in 1986. The International Organization for Standards, ISO, gave SQL formal international standard status in 1987.

Even the ANSI-compliant SQL versions have subtle incompatibilities

Making SQL a standard was supposed to prevent the incompatibilities that were bound to appear if database vendors created their own variations and extensions to the SQL language. Unfortunately, by the time ANSI officially published its standard, it was already too late. IBM's original version of SQL, which had been in use for years, didn't match the ANSI standard. Worse still, because the standard contained options and left some elements of SQL unspecified, even ANSI-compliant SQL versions have subtle incompatibilities. For example, error messages aren't the same in all SQL versions, and catalogs and dictionaries may react differently to the same SQL command under different systems. The result: almost every relational database is "standardized," but no two work the same. Applications that query a relational database using SQL must be written specifically for a particular vendor's database system and version of SQL–hardly a good application of a standard.

SQL Access

SQL's simplicity helped foster the client-server approach to databases because it works by sending relatively simple messages between an application and a database server. It was a short step from that to physically separating the two parts of the process onto different machines on a network.

The growing popularity of client-server databases underscored the need for real working compatibility among different relational database systems. Thus, in 1989, a group of database and hardware vendors, including ASK/Ingres, Tandem, Sun Microsystems, DEC, and HP, began meeting informally to discuss ways to solve the compatibility problem. Out of those meetings came the SQL Access Group, which has now grown to more than 40 members, and includes most major relational database vendors.

The consortium's SQL Access Phase I began as a set of specifications for SQL messages that matched the official ANSI/ISO standard for SQL. Next, the SQL Access technical committee closed loopholes in the original specification, such as error reporting, so that the messages going between client and server would be same for implementations from different vendors. To guarantee compatibility, the group defined an application programming interface (API) for SQL messages. This "embedded SQL API" lets a programmer use library subroutine calls to send SQL messages across the network and receive the responses.

SQL Access Phase I also specifies that SQL Access-compliant clients and serv-

ers must be connected in networks conforming to the Open Systems Interconnect (OSI) specification, an international networking standard. In addition, SQL Access includes requirements that match the draft ISO standard for remote database access, so it conforms to both current and proposed international standards.

In short, SQL Access Phase I specifies not only SQL messages and responses, but also programming interfaces, message packet formats, and even network protocols–virtually guaranteeing that all SQL Access-compliant systems will work with each other.

Including Users Out

The trouble is, while the old ANSI/ISO standard allowed too many variations, the new Phase I specification includes almost nobody. No currently available commercial database software or applications match the Phase I SQL standard. What's worse, most existing SQL-based client-server relational database installations don't use the OSI networks that Phase I requires. For example, UNIX-based networks are likely to use TCP/IP networking, and most DOS-based PC networks run Novell NetWare, neither of which meet the OSI standards.

That means SQL Access Phase I would require most users to not only change applications and database software, but also to replace their networks–hardly an improvement over SQL incompatibility.

Fortunately, there's an answer on the horizon. If Phase I is too restrictive, Phase II (due out next year) will bring the SQL Access specification to far more existing SQL client-server installations. Work on Phase II began in the middle of this year, and will include TCP/IP as an alternative to OSI for networking. Phase II may also include other networking protocols, such as Novell NetWare, and the technical group is considering other additions to the specification as well.

Wait 'Til Next Year?

Another technology Phase II will probably add to the standard is the Sybase-style "call-level SQL interface." Most SQL database products work by sending messages that contain SQL commands and responses between client applications and database servers–so-called "embedded SQL." The application sends a message containing one or more SQL commands to the server; the server interprets the commands, collects the requested data, packages it up, and sends it back to the application. However, if an application repeatedly asks for the same data–or the same kind of data from many different records–the application must repeatedly send virtually identical SQL commands, which can increase traffic on the network. In addition, the database server may spend a significant amount of time translating the same SQL commands.

To circumvent this problem, Sybase developed a system in which entire SQL subroutines can be sent to the server and stored there. When the application wants to use a prestored subroutine, the application invokes it with a single command in an SQL query. The invoking command is shorter, so this approach slightly reduces network traffic, but more importantly, because the prestored SQL subroutine can also be precompiled, it can improve database server response time. The SQL Access technical committee has already begun work on adding a "call-level interface" to bring Sybase and other similar database managers under the SQL Access umbrella.

No products currently match the Phase I SQL standard

How important is the Phase II version of the standard? One indication is that many SQL Access Group members don't intend to create SQL Access-compliant products until the Phase II specification is completed next year. To participate in the Phase I connectivity demonstration, SQL Access Group members modified existing applications and database servers to conform to the standard. Once the SQL Access networking requirements have been expanded to include a large number of existing networks, vendors expect to be able to sell "mix-and-match" versions of SQL programming libraries and other database programming tools. Additionally, non-database applications, such as spreadsheets and word processors, will be able to directly access to databases using the SQL Access specification.

Phase II will complete the work on SQL Access. The specification still needs verification tests to certify that applications, programming libraries, and database servers match it. The X/Open Company Ltd., an SQL Access Group member, has adopted SQL Access Phase I as part of the X/Open Portability Guide and has agreed to create a test suite. The suite, along with the program for X/Open branding, should be available by mid-1992.

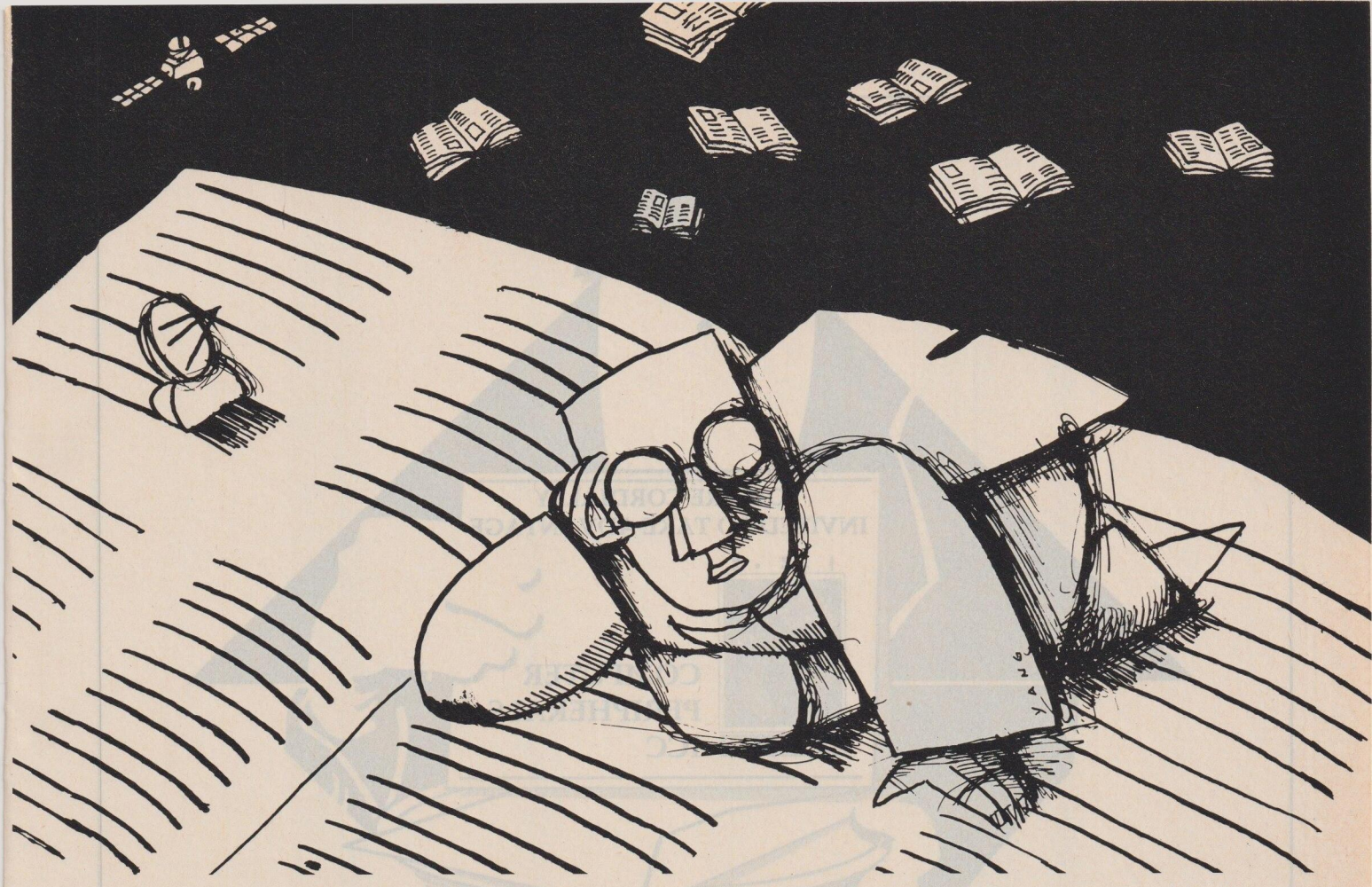
Checking the Data

Another important element for serious database use is two-phase commit, a system that helps prevent errors in which one part of a database is updated but another part is not. This kind of error is a especially a problem in distributed databases, in which different parts of the database may be on different machines. If one machine accepts a database update, but another fails to accept a related update due to a crash or network problem, the distributed database is corrupted. Two-phase commit verifies that all data has been received before it finalizes the update. Phase I doesn't have two-phase commit, but the SQL Access technical committee is considering it for Phase II.

Still another problem is that, while many relational database vendors are part of the SQL Access Group, two of the biggest haven't joined: Computer Associates and IBM. Computer Associates says it supports the SQL Access Group's goals, but the company hasn't decided whether to actually join the group. A key issue is the installed base: while many of the smaller database vendors hope to attract new customers through the SQL Access standard, Computer Associates doesn't want to cause problems for its customers by changing its current version of SQL.

IBM has the same installed base problem, but Big Blue is also intent on interconnecting all its current relational and non-relational database systems on mainframes, minicomputers, and PCs before it focuses on connecting with other vendors' systems. Still, the company says it's not hostile toward the SQL Access Group's interoperability goals, and IBM has its own SQL Access connection: Metaphor Systems, a recent IBM acquisition, is an SQL Access Group member.

SQL Access Phase I is an important step, but it's really just a demonstration. To meet real-world requirements for database interoperability, the specification needs the added elements and features of Phase II. Once those are in place, the SQL Access promise of mixing and matching applications, tools, and database servers can become practical. ■



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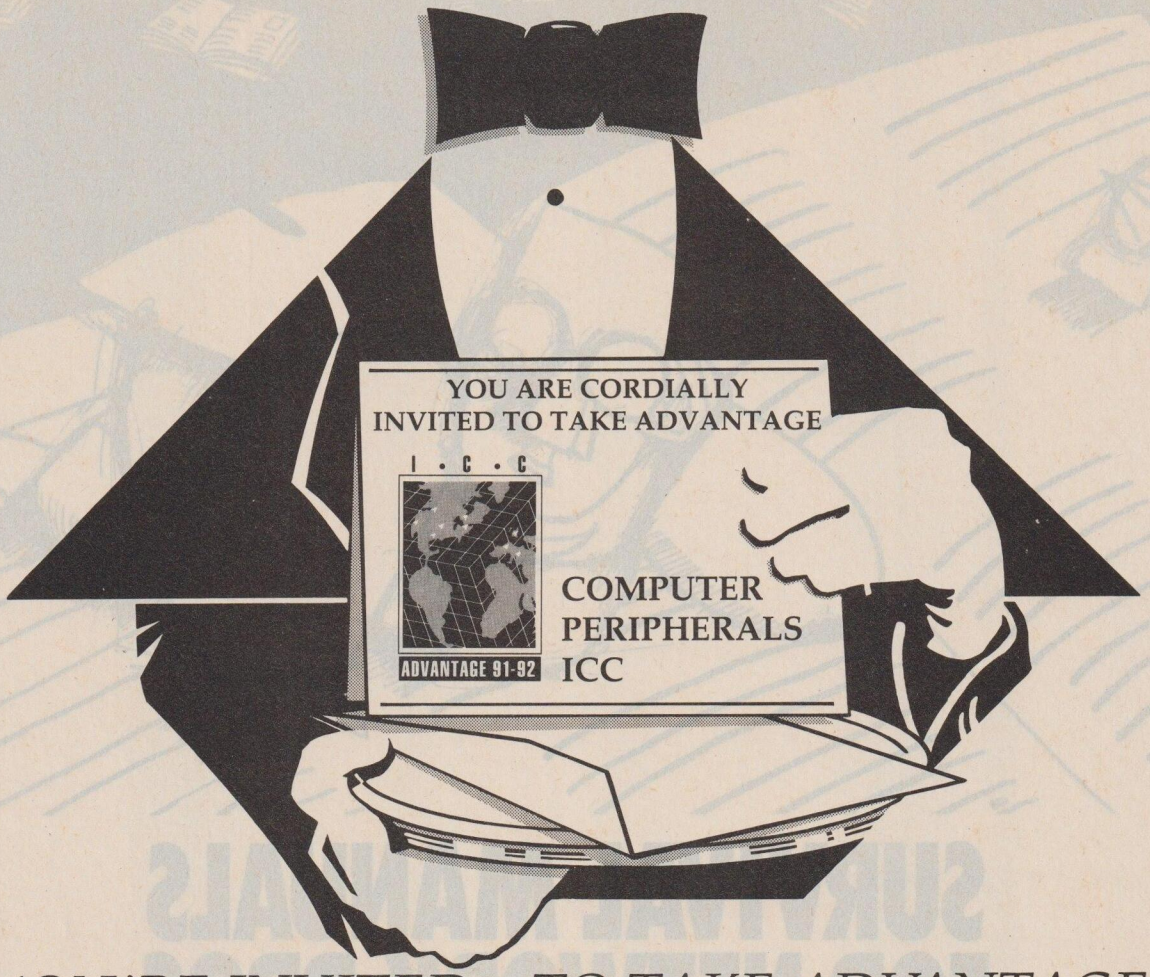

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Controlling Access to SVR4

Here's how to use the new Service Access Facility in System V Release 4 to control login access by terminals or across networks

by Robert A. Heath

Robert A. Heath has been developing UNIX software for NCR products since 1982. He is currently involved with development of an object-oriented system administration package for the NCR System 3000.

Release 4 brings many new features to the tradition of UNIX System V: ANSI C, Berkeley compatibility, Posix compliance, the UFS File System, and a subtler but still important feature, the Service Access Facility (SAF). SAF is innovative because it controls how users access their UNIX system, whether through a standard asynchronous terminal using a modem or through a workstation on a local-area network (LAN).

SAF takes the login service, as it has always been known in UNIX, and merges it with a wider range of networking services to produce a broader definition of *access*, offering some new solutions to some typical problems.

In earlier versions of System V, managing system access required the administrator to hand-edit the **inittab** file, dealing with login control on a process-by-process basis. Controlling the way ASCII terminals from accessed the system was different from how network terminals accessed it. Access could not be easily turned "off" and "on" without shifting the entire system's run level between single- and multiuser mode. SAF solves these problems by unifying the management of user access generally by type and individually by port.

New SAF administrative commands protect the administrator from configuration errors, while allowing experienced users to keep that "hands-on" feel by dealing directly with the configuration files. With the help of SAF, system administrators can more easily add new login ports and extend network services.

This tutorial introduces you to some general SAF concepts, such as the basic way to set up a TTY port, and how to disable and re-enable access without creating major system turmoil. Along the way I'll compare SAF with previous schemes and point out its advantages. Though SAF is general in its concepts, I'll try to explain it in practical terms that the experienced user will recognize and the novice can easily absorb. I'll also point out tips I picked up from first-hand experience.

The SAF Umbrella

In this era of open systems, systems designers strive to offer well-defined interfaces so that customers and value-added resellers can easily add new features. SAF meets this goal by serving as a general overseer of any number of specialized means of system access. SAF can easily accommodate new types of network access while allowing the administrator to control them in a consistent manner.

SAF is not one program but a layered collection of daemon, or background, processes and administrative commands (see Figure 1). Its high-level programs include the Service Access Controller Administrator (**sacadm**), Service Access Controller (**sac**), and Port Monitor Administrator (**pmadm**), all of which are network independent.

At a lower level, SAF includes network-specific utilities, such as the TTY Monitor (**ttymon**) and network listener (**listen**) and their respective administrative utilities–**ttyadm** and **nlsadmin**. At this level vendors may offer alternatives to the standard services delivered with System V Release 4 (SVR4).

The Service Access Controller

The Service Access Controller (SAC) is the master process that oversees all other SAF processes. The **init** process launches SAC when the system goes into multiuser mode. A SVR4 system typically arrives installed with an entry for SAC in the **/etc/inittab** file, as shown in Listing 1, which means you don't have to take any special action to create or to start up SAC.

Listing 2 shows a process status list-

ing of SAC and related SAF processes. SAC runs continuously while the system is at a multiuser run-level whether or not external access is active. SAC monitors and restarts lower-level processes, fulfilling the role of the **init** process found in earlier versions of System V. Like **init**, only one instance of **sac** can run at a time.

SAC is independent of any networking scheme or protocol and starts and regulates one or more network-dependent processes called port monitors. It takes one argument, the *sanity_interval*, which is the period over which SAC polls its port monitors to verify that they are still running. In this way, SAC can restart a port monitor that fails to respond to polling during the sanity interval. The periodic check between SAC and its port monitors improves the overall availability of the system.

The SAC Administrative Command

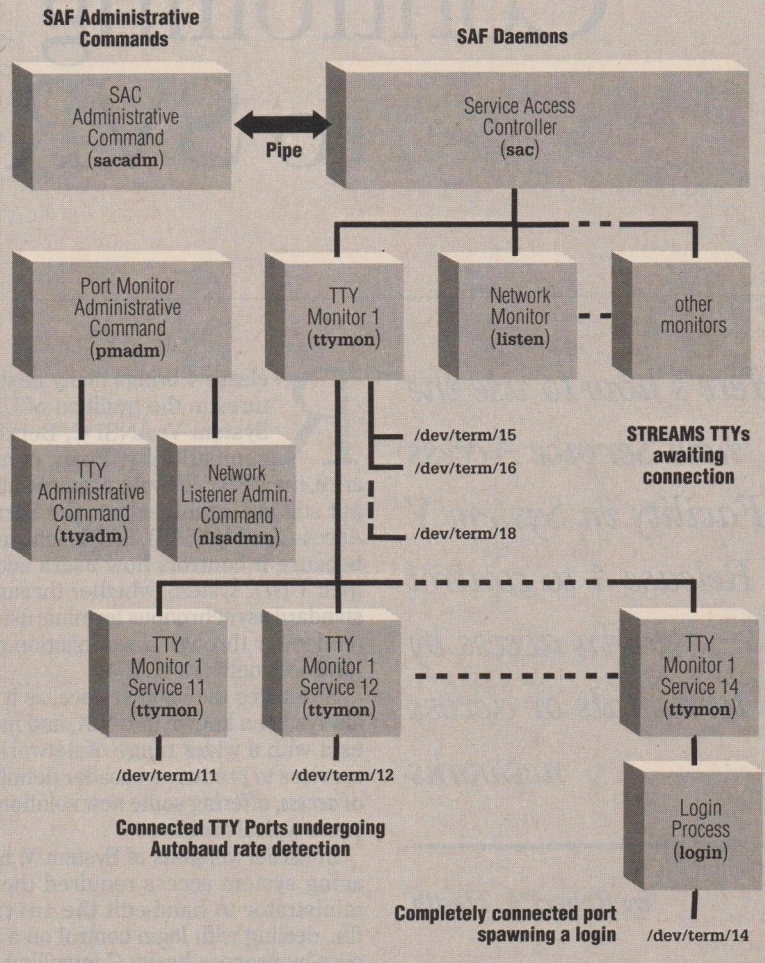
The **sacadm** command is the administrator's primary management tool over SAF which communicates with the **sac** daemon to perform the following high-level operations:

- add or remove a port monitor
- enable or disable a port monitor
- start or stop a port monitor
- add or replace the SAF configuration script
- add or replace a port monitor configuration script
- direct SAC to reread its database

With 11 variations, **sacadm** uses most of the alphabet for option characters and because it attempts to manage all aspects of the port monitors, **sacadm** appears to be many commands rolled into one.

Figure 1: Service Access Facility

The Service Access Facility is a layered architecture. The Service Access Administrative Command interacts with the SAF Daemon through a named pipe.



Port Monitor Concepts

A port monitor is a single process that waits for an incoming connection on one or more physical ports. In the terminal world, a physical port would be a TTY device associated with a modem or directly connected ASCII terminal. In the network world, a port might be a network endpoint or an Internet Protocol socket address. An endpoint is the network counterpart to a TTY device such as **/dev/tty00**.

The port monitor is similar to the **getty** process found in previous versions of UNIX. The difference is that one **getty** process is required for each TTY line, while a port monitor takes advantage of System V STREAMS technology to simultaneously monitor multiple physical ports. In this respect, a port monitor might more accurately be named a *ports* monitor. UNIX processes previously used to monitor multiple ports are freed up for other uses.

Following a successful connection, a port monitor transfers control to a follow-up service, usually a **login** process. Listing 2 shows that one **listen** port monitor and two **ttymon** port monitors are running. Port monitors are instances of port monitor types: executable programs from which SAC spawns all port monitor instances for a given type of access.

A type designator is assigned to each port monitor type and is conventionally named from the simple filename of the particular port monitor program. Listing 3A shows two such type designators–the program **/usr/lib/saf/ttymon** implements the **ttymon** port monitor type and **/usr/lib/saf/listen** implements the **listen** type.

Each port monitor is identified by its port monitor tag, a unique name of up to 14 characters that is assigned to it when it is defined. The port monitor tag eliminates the need for administrators to keep track of the UNIX process ID of the port monitor supervising a given set of ports. One convention for creating a port monitor tag is to add a sequence number to its port monitor type. Listing 3A shows some port monitor tags. For example, **ttymon1** is the first port monitor of type **ttymon**. Though it doesn't have a sequence number, **tcp** is a port monitor of type **listen**.

Service Concepts

Within the SAF framework, a separate TTY port or network endpoint is associated with an SAF service. A service is not a process, but the act of monitoring

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a port via a Stream, because within SAF, the term *service* implies a port.

You must assign a service tag, or name, to a physical port when you associate it with a given port monitor. A service tag may be named after the file name of a TTY device or after the port number of a TCP/IP endpoint. Listing 3B shows some service tags. For example, service tag 11 is associated with TTY device **/dev/term/11**. In SVR4, TTY devices have names in the form of **/dev/term/*nn*** where *nn* is a TTY port number. The same device might have been named **/dev/tty*nn*** in previous versions of System V.

Service tags are local to a given port monitor and must be called out with their port monitor tag to be unambiguous. Service tags can also be up to 14 characters long.

Administering Services with pmadm

The **pmadm** command is the user's primary tool to manage services, or ports, under the SAF port monitors and to communicate with the **sac** daemon to perform the following activities:

- add or remove a service
- enable or disable a service
- add or replace a service configuration script
- list service configurations and status

Though not shown here, **pmadm** has eight variations and, because it attempts to manage all aspects of services under the port monitors like **sacadm** it appears as many commands rolled into one.

TTY Monitor Replaces getty

The flexible use of TTY communications has always been one of UNIX's strong features. The standard SVR4 TTY monitor program, **ttymon**, manages any combination of directly connected terminals or modem lines. The main service **ttymon** provides is spawning the appropriate login service when a terminal connects. A single TTY Monitor can control multiple TTY ports with Streams and the number of connections is limited only by the number of files that a TTY monitor can open. The connection indicator can be the detection of the remote modem's carrier signal or, more reliably, the receipt of the first character typed at the terminal. For hard-wired terminals that stay turned on, the number of idle processes under SAF would be the same as under previous schemes unless you set up connection to detect receipt of the first character. In the case of modem lines, **ttymon** goes even further to provide automatic baud rate matching of incoming calls before spawning a login.

Figure 1 shows how this works. TTY Monitor 1 is monitoring TTY devices **/dev/term/15** through **/dev/term/18** for a connection. At the same time, TTY Monitor 1 has forked copies of itself to service TTY devices **/dev/term/11** through **/dev/term/13**, which have already connected and are undergoing baud rate detection.

During baud rate detection, the TTY monitor expects you to enter a carriage return <Ctrl-M> character. The TTY monitor attempts to match the incoming pattern according to how <Ctrl-M> appears at different baud rates. On finding a match, the TTY monitor changes the baud rate of the port to match that of your terminal. Once the baud rate has been detected, the TTY monitor child process spawns a **login** process (**/dev/term/14** in Figure 1) and then exits.

In another example, Listing 2 shows that **ttymon** process 529 has forked to create process 634 which is performing baud rate detection. Its TTY entry, **term/11** shows that the port is already physically connected.

The **ttymon** process replaces **getty** and **uugetty** of earlier versions of System V, except that a single **ttymon** process may monitor multiple physical ports. Listing 3A shows one TTY port monitor instance, named **ttymon1**, driven by the standard TTY Monitor command, **/usr/lib/saf/ttymon**. Like all port monitors, **ttymon** is never started directly by the user, but by the **sacadm** process or **init**.

The ttyadm Command

The **ttyadm** command is the administrative companion to **ttymon**. It configures the service when a new port is added,

Figure 2: SAF Resources

SAF resources have "Tag Names" which serve as keys into SAF administrative files.

SAC Administrative table (/etc/saf/_sactab) viewed using sacadm -l

```
PMTAG     PMTYPE  FLGS RCNT  STATUS      COMMAND
ttymon1   ttymon    -    0   ENABLED     /usr/lib/saf/ttymon # board 1
ttymon2   ttymon    -    0   ENABLED     /usr/lib/saf/ttymon # board 2
tcp       listen    -    0   ENABLED     /usr/lib/saf/listen   # TCP/IP
```

TTY Port Monitor #1 table (/etc/saf/_ttymon1/_pmtab) viewed using pmadm -l -p ttymon1

```
PMTAG     PMTYPE  SVCTAG  FLGS  ID    PMSPECIFIC
ttymon1   ttymon  11        u   root  /dev/term/11 - - /usr/bin/login - 9600 - login: -
ttymon1   ttymon  12        u   root  /dev/term/12 - - /usr/bin/login - 9600 - login: -
```

TTY Port Monitor #2 table (/etc/saf/_ttymon2/_pmtab) viewed using pmadm -l -p ttymon2

```
PMTAG     PMTYPE  SVCTAG  FLGS  ID    PMSPECIFIC
ttymon2   ttymon  21        u   root  /dev/term/21 - - /usr/bin/login - 9600 - login: -
ttymon2   ttymon  22        u   root  /dev/term/22 - - /usr/bin/login - 9600 - login: -
```

TTY Definitions File (/etc/ttydefs)

```
# VERSION =1
9600 : 9600 hupcl opost onlcr tab3 ignpar ixon ixany parenb istrip echo \
   echoe echok isig cs7 cread : 9600 hupcl opost onlcr sane tab3 ignpar \
   ixon ixany parenb istrip echo echoe echok isig cs7 cread : : 4800
4800 : 4800 hupcl opost onlcr tab3 ignpar ixon ixany parenb istrip echo \
   echoe echok isig cs7 cread : 4800 hupcl opost onlcr sane tab3 ignpar \
   ixon ixany parenb istrip echo echoe echok isig cs7 cread : : 4800
2400: 2400 hupcl opost onlcr tab3 ignpar ixon ixany parenb istrip echo \
   echoe echok isig cs7 cread : 2400 hupcl opost onlcr sane tab3 ignpar \
   ixon ixany parenb istrip echo echoe echok isig cs7 cread : : 1200
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   echoe echok isig cs7 cread : 1200 hupcl opost onlcr sane tab3 ignpar \
   ixon ixany parenb istrip echo echoe echok isig cs7 cread : : 9600
```

TCP Port Monitor table (/etc/saf/tcp/_pmtab) viewed using pmadm -l -p tcp

```
PMTAG  PMTYPE  SVCTAG  FLGS  ID    PMSPECIFIC
tcp    listen    101      -   listen - - c - /usr/lib/uucp/uucico -r 0 -i TLI -u nuucp #uucplistenerr
```

LISTING 1: Portion of the /etc/inittab file, showing the sac command.

```
# cat /etc/inittab
bchk::sysinit:/sbin/bcheckrc </dev/console >/dev/sysmsg 2>&1
is:3:initdefault:
r0:0:wait:/sbin/rc0 off 1> /dev/sysmsg 2>&1 </dev/console
r1:1:wait:/sbin/rc1  1> /dev/sysmsg 2>&1 </dev/console
r2:23:wait:/sbin/rc2 1> /dev/sysmsg 2>&1 </dev/console
r3:3:wait:/sbin/rc3  1> /dev/sysmsg 2>&1 </dev/console
r5:5:wait:/sbin/rc0 reboot 1> /dev/sysmsg 2>&1 </dev/console
r6:6:wait:/sbin/rc6 reboot 1> /dev/sysmsg 2>&1 </dev/console
sc:234:respawn:/usr/lib/saf/sac -t 300         # Service Access Controller
et:1234:respawn:/usr/lib/saf/ttymon -g -d /dev/term/13 -l 2400 # express mode
```

LISTING 2: This output segment from a ps command shows active SAF processes sac, listen, and ttymon.

```
# ps -ef
     UID   PID  PPID  C    STIME TTY      TIME COMD
    root     0     0  0   Jul 11 ?       0:04 sched
    root     1     0  0   Jul 11 ?       0:49 /sbin/init
    root   526     1  0   Jul 11 ?       0:01 /usr/lib/saf/sac -t 300
    root   528   526  0   Jul 11 ?       0:00 /usr/lib/saf/listen tcp
    root   529   526  0   Jul 11 ?       0:01 /usr/lib/saf/ttymon
    root   634   529  0   Jul 11 term/11 0:01 /usr/lib/saf/ttymon
```

but unlike **stty**, which immediately configures a TTY port, **ttyadm** formats permanent configuration information for use every time the port is activated. Modem lines controlled by **ttymon** can be configured as dial-in, dial-out, or bidirectional using the corresponding TTY administrator, **ttyadm**.

Each physical port, or service, can be individually configured for options such as different bit rates and parity by referencing a configuration in the **/etc/ttydefs** file. Figure 2 shows a TTY definition of **9600** for service **22**. This TTY definition is not a bit rate, but rather a symbol defined in **ttydefs** that reflects a particular combination of bit rate, parity, and other settings. The **ttydefs** file replaces the **/etc/gettydefs** file of earlier versions of System V.

TTY Monitor Express Mode

If necessary, the TTY Monitor can be used without SAC. When running by itself, a TTY Monitor is said to be in *express* mode and, in fact, behaves much like the **getty** program it supersedes. Special ports that must be available during all run levels, such as the system console or remote maintenance modem ports, can be handled by express mode TTY monitors. To create an express mode TTY monitor, place an entry in **/etc/inittab** similar to the last line in Listing 1.

The Listen Monitor

In a LAN environment **listen**, sometimes called the network listener, monitors incoming network connection requests and resembles the **portmap** process found on BSD systems. Unlike the TTY Monitor, the **listen** may accept a variety of different services through the same port. Some examples are:

- remote login
- UNIX-to-UNIX copy **uucp**
- remote procedure calls
- network naming services

Listing 3 shows an example of the **listen** process implemented as the **/usr/lib/saf/listen** program.

The network listener has its own configuration counterpart, **nlsadmin**. Unlike **ttyadm**, **nlsadmin** can interact directly with its port monitor–the **listen** processes. **nlsadmin** can translate command line arguments into colon-separated configuration parameters when adding a network port monitor using **sacadm** or a network service using **pmadm**. The **nlsadmin** command has 17 variations and, like other administrative commands in the SAF family, it attempts to provide every conceivable service to the objects it manages.

Network services are more dependent upon the system vendor than TTY services, which tend to be more uniform across vendors. The reason is that network services are typically optional on UNIX systems, whereas TTY support is a standard feature. For this reason we'll stress TTY administration more than network administration under SAF.

SAF's Hidden Administrative Files

SAF offers a pair of do-it-all administrative commands, **sacadm** and **pmadm**, which add, delete, modify, and display all SAF components. SAF hides its private data files, allowing access to them only through well-defined commands. In this respect, SAF employs object-oriented techniques.

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LISTING 3: SAF administrative commands show the status of service components.

A. The **sacadm -l** *command lists port monitor status:*

```
# sacadm -l
PMTAG     PMTYPE  FLGS RCNT STATUS      COMMAND
ttymon1   ttymon  -    0    ENABLED     /usr/lib/saf/ttymon # TTY Adapter 1
tcp       listen  -    0    ENABLED     /usr/lib/saf/listen # TCP/IP
```

B. The **pmadm -l** *command lists currently active services:*

```
# pmadm -l
PMTAG   PMTYPE  SVCTAG FLGS ID     PMSPECIFIC
ttymon1 ttymon  11     u    root   /dev/term/11 - - /usr/bin/login - 9600 \
                                    - login: - # TTY Adapter 1, Port 1
ttymon1 ttymon  12     u    root   /dev/term/12 - - /usr/bin/login - 9600 \
                                    - login: - # TTY Adapter 1, Port 2
tcp     listen  101    -    listen - - c - /usr/lib/uucp/uucico -r 0 \
                                    -i TLI -u nuucp #uucplistener
```

LISTING 4: SAF administrative files are hidden from the user.

A. **/etc/saf/_sactab** *lists port monitors and their parameters:*

```
# cat /etc/saf/_sactab
# VERSION=1
ttymon1:ttymon::0:/usr/lib/saf/ttymon   # TTY Adapter 1
tcp:listen::0:/usr/lib/saf/listen tcp   # TCP/IP
```

B. **/etc/saf/ttymon1/_pmtab** *lists port monitor* **ttymon1***'s services:*

```
# cat /etc/saf/ttymon1/_pmtab
# VERSION=1
11:u:root:reserved:reserved:reserved:/dev/term/11:br:0:/usr/bin/login::\
        9600::login\: ::#dial in/out line
12:u:root:reserved:reserved:reserved:/dev/term/12:br:0:/usr/bin/login::\
        9600::login\: ::#dial in/out line
```

LISTING 5: SAF administrative commands create SAF components.

A. The **sacadm** *command adds a second TTY port monitor for the new TTY adapter:*

```
# sacadm -a -p ttymon2 -t ttymon -c /usr/lib/saf/ttymon -v 1 \
        -y "TTY Adapter 2"
```

B. **Pmadm** *commands add login services for two additional TTY ports on the new adapter:*

```
# pmadm -a -p ttymon2 -s 21 -i root -fu -v 1 -m "`ttyadm -d /dev/term/21 \
        -l 9600 -s /usr/bin/login -p \"login:\"`"-y "TTY Adapter 2, Port 1"
# pmadm -a -p ttymon2 -s 22 -i root -fu -v 1 -m "`ttyadm -d /dev/term/22 \
        -l 9600 -s /usr/bin/login -p \"login:\"`" -y "TTY Adapter 2, Port 2"
```

The standard documentation discourages you from directly editing the hidden SAF files. However, you can edit the files and then alert the system to re-examine the files with the command **pmadm -x**.

Listing 4A shows the main administrative file, **/etc/saf/_sactab**, which contains SAF's list of port monitors. The first line of the file is a version number that dictates the format of the rest of the file. When adding a new port monitor, as an apparent safety feature, **pmadm** requires the user to provide a version number that matches the file's version number.

Another administrative file, **/etc/saf/_sysconfig**, contains a per-system configuration script coded in an interpretive language. The **_sysconfig** file's purpose is to provide a "hook" for system-dependent procedures that must be run at SAC start-up. Typically this script is preconfigured by the manufacturer so the user does not have to modify it.

Each instance of a port monitor receives its own port monitor table file with a name in the form of **/etc/saf/***pmtag*/**_pmtab**. The port monitor's tag name is part of the file's path, making a given port monitor's configuration file easy to look up. Listing 4B shows the contents of a typical **_pmtab** file–a table of services controlled by the given port monitor. Similar to the **_sactab** file, the **_pmtab** file contains a version number. When adding a new service, the **pmadm** command requires the user to provide a version number that matches the file's version number.

continued

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Just as the **_sysconfig** file contains global SAF configuration hooks, each port monitor instance has an interpretive configuration file with a name of the form **/etc/saf/***pmtag*/**_config**. The **_config** file may specify alternate Streams modules to push, or additional scripts to run, when a port monitor instance is launched.

Adding TTY Services with SAF Commands

Let's actually use some SAF commands that add an additional TTY monitor and two TTY port services to a running system. We'll add to the configuration already shown in Listings 3A and 3B.

You must first log in as "root" because you will need superuser privileges to administer SAF. Next, verify that SAC is already running using **ps** as shown in Listing 2. The process name **sac** appearing in the output shows that it is running.

Let's assume that you installed an additional TTY adapter in your UNIX system before booting. We'll add an additional TTY monitor, which we'll call **ttymon2**, to handle all TTY ports on that adapter. We could simply allow the existing port monitor, **ttymon1**, to handle the new ports, but as a rule of thumb we'll assign one TTY monitor instance per physical adapter. **ttymon** itself does not address a physical adapter–only its TTY ports. SAF relegates management of the physical adapter to the individual vendor that typically provides a machine-specific device driver and any necessary management utilities. Unlike TTY ports, the abstraction of a physical TTY adapter is not standard in SVR4.

continued

LISTING 6: checking that all services are currently active

A. The **sacadm** *command shows that* **ttymon2** *is now active:*

```
# sacadm -l
PMTAG     PMTYPE  FLGS RCNT STATUS      COMMAND
ttymon1   ttymon  -    0    ENABLED     /usr/lib/saf/ttymon # TTY Adapter 1
ttymon2   ttymon  -    0    ENABLED     /usr/lib/saf/ttymon # TTY Adapter 2
tcp       listen  -    0    ENABLED     /usr/lib/saf/listen # TCP/IP
```

B. The **pmadm** *command shows that service tags* **21** *and* **22*** *have been added:*

```
# pmadm -l
PMTAG   PMTYPE  SVCTAG FLGS ID     PMSPECIFIC
ttymon1 ttymon  11     u    root   /dev/term/11 - - /usr/bin/login - 9600 \
                                    - login: - # TTY Adapter 1, Port 1
ttymon1 ttymon  12     u    root   /dev/term/12 - - /usr/bin/login - 9600 \
                                    - login: - # TTY Adapter 1, Port 2
ttymon2 ttymon  21     u    root   /dev/term/21 - - /usr/bin/login - 9600 \
                                    - login: - # TTY Adapter 2, Port 1
ttymon2 ttymon  22     u    root   /dev/term/22 - - /usr/bin/login - 9600 \
                                    - login: - # TTY Adapter 2, Port 2
tcp     listen  101    -    listen - - c - /usr/lib/uucp/uucico -r 0 \
                                    -i TLI -u nuucp #uucplistener
```


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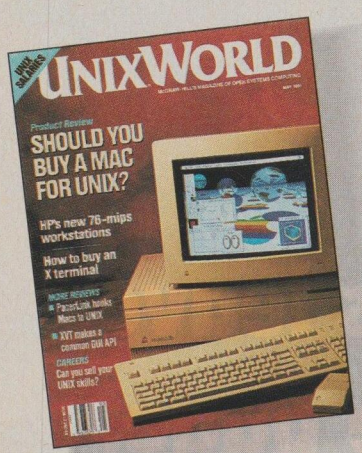

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Listing 5A shows how to add a second TTY monitor using the **sacadm** command. The command defines a port monitor tag, **ttymon2**; a port monitor type, **ttymon**; and the port monitor command, **/usr/lib/saf/ttymon**. It even adds a comment to remind us that the new TTY monitor is covering the TTY ports on Adapter 2. The **sacadm** command shown in Listing 5A simultaneously adds the TTY monitor and activates it–but we still need to add services for the physical TTY ports.

We'll add simple login services for two directly connected, 9600 bits-per-second terminal lines on TTY ports **/dev/term/21** and **/dev/term/22** on the new adapter. Listing 5B shows how to use **pmadm** commands and options to add a service for the new ports.

The **-p** option introduces the name of the port monitor, **ttymon2**, which handles the two new ports.

The **-s** option introduces the service tags, 21 and 22, that effectively name a port service under SAF. Notice that the service tag name is the same as the simple filename of the TTY device appearing later in the command.

LISTING 7: The ps command shows the newly active TTYMON process

```
# ps -ef
     UID   PID  PPID  C    STIME TTY      TIME COMD
    root     0     0  0   Jul 11 ?       0:04 sched
    root     1     0  0   Jul 11 ?       0:49 /sbin/init
    root   526     1  0   Jul 11 ?       0:01 /usr/lib/saf/sac -t 300
    root   528   526  0   Jul 11 ?       0:00 /usr/lib/saf/listen tcp
    root   529   526  0   Jul 11 ?       0:01 /usr/lib/saf/ttymon
    root   550   526  0   Jul 11 ?       0:00 /usr/lib/saf/ttymon
```

LISTING 8: The sacadm command lets you quickly disable or enable all ports of a given type.

A. These **sacadm** *commands disable all TTY ports under the port monitors* **ttymon1** *and* **ttymon2***:*

```
# sacadm -d -p ttymon1
# sacadm -d -p ttymon2
```

B. These **sacadm** *commands re-enable all TTY ports under the port monitors* **ttymon1** *and* **ttymon2***:*

```
# sacadm -e -p ttymon1
# sacadm -e -p ttymon2
```

The **-i** option designates which user ID the process runs under; here, the user ID is "root."

The **-fu** option indicates that an entry is placed in the **/etc/utmp** file for the given service which will help audit the login procedure.

The **-v** option is the version number of

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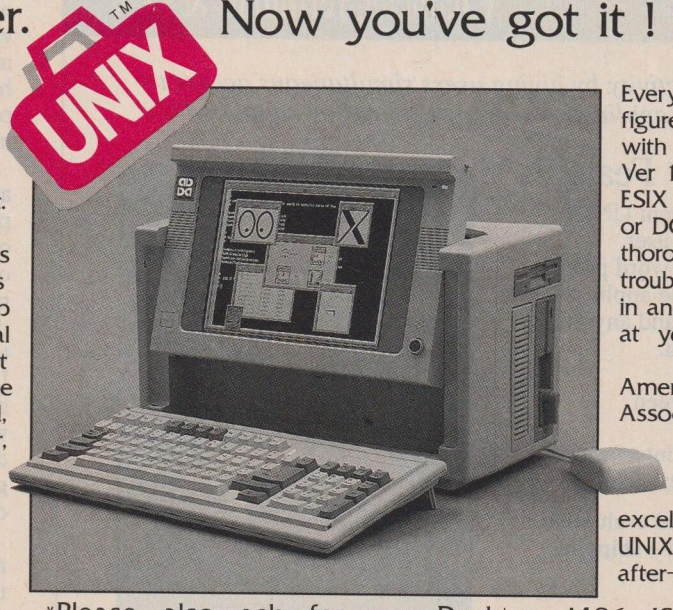

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LISTING 9: The sacadm command reports that both TTY monitors are disabled.

```
# sacadm -l
PMTAG     PMTYPE  FLGS RCNT STATUS      COMMAND
ttymon1   ttymon  -    0    DISABLED    /usr/lib/saf/ttymon # TTY Adapter 1
ttymon2   ttymon  -    0    DISABLED    /usr/lib/saf/ttymon # TTY Adapter 2
tcp       listen  -    0    ENABLED     /usr/lib/saf/listen # TCP/IP
```

the current port monitor administrative file, which is currently "one."

The **-m** option introduces port monitor-specific options which usually come from a port monitor administrative command. The embedded **ttyadm** command takes a number of TTY service arguments and translates them into the proper format to store in the TTY monitor's administrative file, **/etc/saf/ttymon2/_pmtab**. The first **ttyadm** specifies the TTY device **/dev/term/21**, a **ttydefs** label of 9600, a service of **/usr/bin/login**, a login string, and finally a comment.

After adding and activating the new components, we can use **pmadm** and **sacadm** to display the final configuration. Listing 6A shows the new TTY monitor, **ttymon2**; Listing 6B shows the new services, **22** and **22** under **ttymon2**; and the new TTY monitor also shows up as process 550 in Listing 7.

Enabling and Disabling Services

So far, setting up a couple of new TTY ports appears complicated, especially if you are used to cloning a couple of **getty** entries in your **inittab** file. But here's where using SAF pays off. Listing 8A shows how you can quickly disable a given TTY monitor and all ports under it with the "disable" version of **sacadm**. To verify that the TTY monitors have been disabled, use the "list" variation of **sacadm** shown in Listing 9. The procedure leaves the TTY monitors running, but directs them to reject incoming connections. You can even set up ports to display a message that warns anyone who tries to log in that the port is disabled. Anyone already logged in when a port is disabled, remains logged in.

Listing 8B shows how you can re-enable all the same TTY ports just by re-enabling the TTY monitors that control them. You can verify that the TTY monitors are reactivated by using the same **sacadm** and receiving the same results you got before in Listing 6A.

We just disabled and re-enabled all TTY ports using the high-level **sacadm** command. We could have as easily disabled and re-enabled any individual port using the **pmadm** command, but we would have had to repeat it to disable each port.

Needless to say, **pmadm** and **sacadm** are lengthy and complex, which makes them good candidates to be placed in shell scripts. If you find the command line approach to SAF intimidating, you may prefer a menu-oriented method of system administration. SVR4's Operations, Administration, and Management (OA&M) package allows you to administer various subsystems, including SAF, through menus and scripts.

SAF Benefits

As a serviceability benefit, SAF maintains sets of log files in text form. On a global basis, the SAC deposits information in the log file **/var/saf/_log**. Individual port monitors maintain separate log files with names of the form **/var/saf/***pmtag*/**log**. One useful piece of information found in a TTY monitor's log is the maximum number of ports it can monitor. You can use this value to plan how many ports to let it monitor. Reading over the log files may help diagnose problems in modem use, port configuration, logging in, and dial-in usage.

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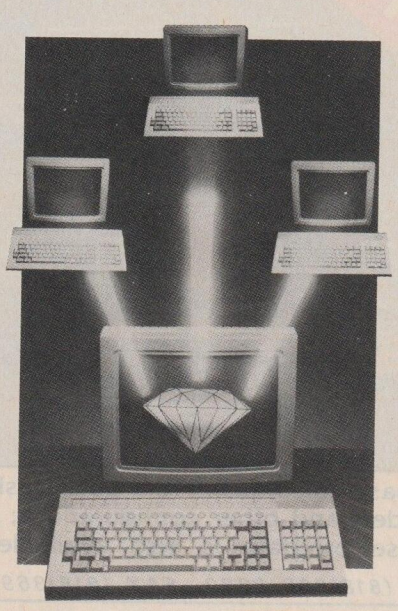

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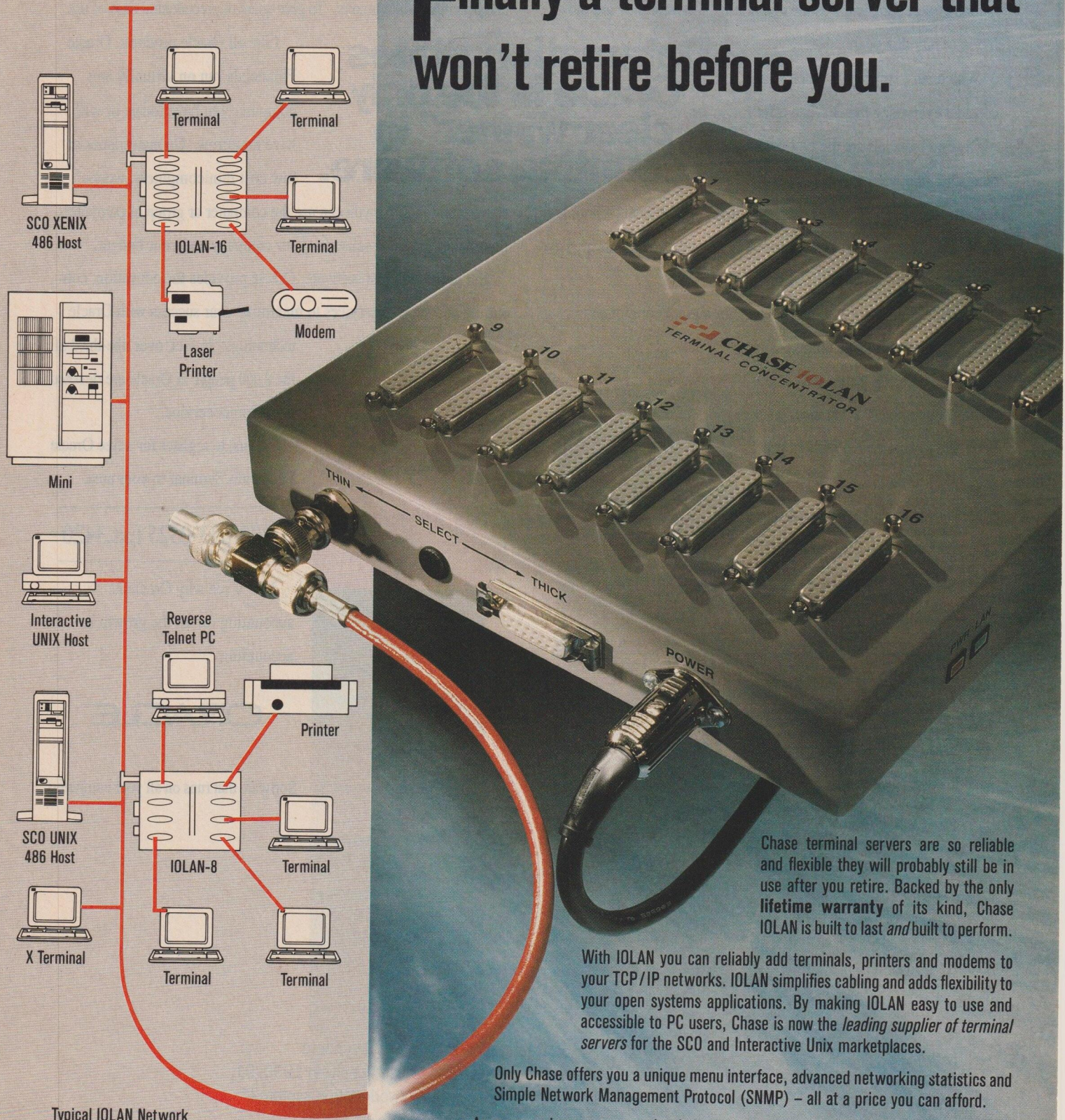

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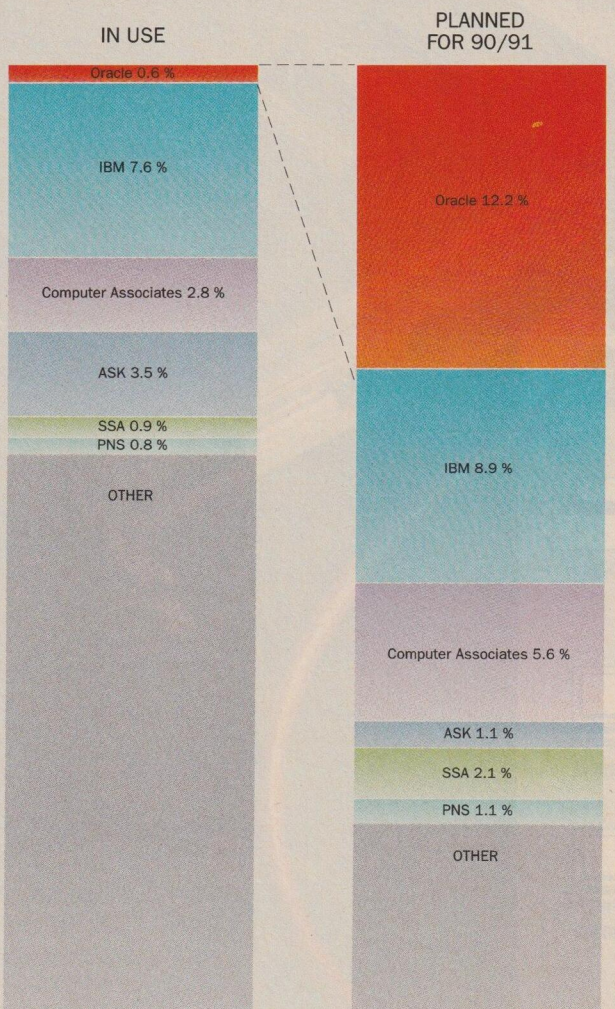

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Now Hear This

Dear Dr. Thomas:

I've often needed a way to broadcast a message to selected hosts on our LAN in order to announce maintenance schedules, downtimes, meetings, or other items of general interest.

Although you can use **rwall** to send such messages, I wanted to be able to build a list of target hosts dynamically, with the option to exclude certain hosts. The enclosed **writenet** shell script provides this capability.

[*Doctor's note:* Part A of Listing 1 depicts the shell script, Parts B and C show sample **/etc/hosts** and **/etc/writenet.excld** files, and Part D depicts a usage example.]

After installing the script, the only administrative assistance required is to maintain the list of excluded hosts, which is implemented as a newline-separated list of host names in a file defined by the **writenet** script. Networked hosts, such as PCs, that don't run **rwalld** are excluded. [Also exclude all hosts that aren't in your administrative domain.]

You could "ping" each host to see if it is up before using **rwall**. However, this can be avoided by simply letting **rwall** time out if it can't reach a host. In this case you would get a message like "rwall:can't send to *hostname* : timeout."

I wrote and tested this script on a Sun Microsystems IPC running SunOS 4.1.1. Our local network includes about 25 nodes and runs NIS (Network Information Service, formerly called "Yellow Pages"). This script also runs on our older Silicon Graphics Iris machines under System V, which don't use NIS.

LISTING 1: The contributed `writenet` script dynamically builds a list of hosts and invokes `rwall` to broadcast a message to them.

***A.** Listing of the **writenet** Bourne shell script:*

```
 1  #!/bin/sh
 2  # @(#) writenet  Write to hosts on network
 3  # Author: Gregory DeRenne
 4  # Modified by Becca Thomas and Ray Swartz, July 1991
 5  EXCLUDELIST=/etc/writenet.excld # Contains list of hosts not writable
 6  # Set command search path:
 7  PATH=/bin:/usr/bin:/usr/sbin:/usr/etc
 8  # If interrupted display termination message and exit:
 9  trap 'echo "$0 interrupted, exiting ..." >&2; exit 0' 1 2 3 15 16 17
10  # Make sure exclude list file exists:
11  if [ ! -r $EXCLUDELIST ]; then
12      echo "Exiting, exclusion file, \"$EXCLUDELIST\", not accessible" >&2
13      exit 1
14  fi
15  # Determine UNIX version for proper ps command line:
16  if [ -f /vmunix ]; then # kernel name for BSD and SunOS
17      Ps_opts=ax  # Use options for BSD ps
18  else
19      Ps_opts=-e  # Use options for AT&T-like ps
20  fi
21  echo "Building network host list ..."
22  # If host runs ypbind it's a NIS client
23  if [ -z "`ps $Ps_opts | grep ypbind | grep -v grep`" ]; then
24      Hostlist=`cat /etc/hosts | grep -v \# |
25          awk '{print $2}'|fgrep -v -f $EXCLUDELIST`
26  else
27      Hostlist=`ypcat hosts |
28          awk '{print $2}'|fgrep -v -f $EXCLUDELIST`
29  fi
30  echo "Done."
31  # Prompt user with directions
32  echo "Type in message ending it with control-D on last line"
33  # Collect input and send the message:
34  rwall -h $Hostlist
```

***B.** Contents of a sample **/etc/hosts** file:*

```
# Host Database for Opus Systems' SPARC Clone (yin)
# SunOS 4.1.1 Version 5
```

continued

[*Doctor's explanation of* **writenet** *operation.* First, line 5 defines the required exclude list file (see below). Then line 7 defines the command search path in **PATH** to contain all the directories necessary to search for the utilities called by the script. I've included directories from different UNIX versions in one list for convenience. The extra directories will not cause problems if they are not part of your implementation. Make sure the path includes directories containing **rwall**, and perhaps **ypcat**, because these commands might be in an unusual location. Line 9 sets a trap for common termination signals which, if sprung, will display a message before the script exits.

I've placed the exclusion list in a file rather than hard-coded it in the **writenet** script. Although this approach requires maintaining an extra file, it avoids changing the source code for the script itself. A system administrator or operator may know how to edit a file, but may not know shell programming syntax.

The exclusion list file path name is

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Listing 1 continued

```
# If the NIS is running,
# this file is only consulted when booting
127.0.0.1  localhost
192.9.200.5  yin  loghost
192.9.200.4  yang
192.9.200.3  tventure
192.9.200.2  lechien
192.9.200.1  lechat
```

C. Contents of a sample exclude list file:

```
localhost
lechien
lechat
```

D. Example showing **writenet** *composing message interactively:*

```
# writenet
Building network host list ...
Done.
Type in message ending it with control-D on last line
I'm going to bring down node earth at 5:00pm today.
Please page, phone, or e-mail if this presents a problem.
    Greg (x2104)
<Control-D>
```

E. Example of using **writenet** *to send the contents of a message file and discard any prompts sent to the standard output:*

```
# writenet <message.file >/dev/null
```

LISTING 2: The steps of running ps to display process information, select candidate processes, and send them a signal can be automated using the zap script presented here.

A. Listing of the **zap** *Bourne shell script:*

```
 1  #!/bin/sh
 2  # @(#) zap  Send signal to selected process(es)
 3  # Author: George Chiesa, November 1989
 4  # Modified by Becca Thomas and Ray Swartz, July 1991
 5  # set -x        # Uncomment for debugging
 6  Interactive=""  # Default is non-interactive mode
 7  Ps_path=/bin/ps # Full path name for ps command
 8  Signo=15        # Default signal is software termination
 9  Tmpfile="/tmp/`basename $0`$$"  # temp storage for ps output
10  # Correct command-line invocation usage:
11  Usage="Usage: `basename $0` [ -i ] [ -s signalnumber ] pattern"
12  # Clean up temporary file on normal exit or interrupt:
13  trap 'rm $Tmpfile >/dev/null 2>&1; exit 0' 0 1 2 3 15
14  # Process command-line options:
15  if [ "$OPTIND" = 1 ]; then  # can use getopts
16      while getopts is: flag ; do
17          case $flag in
18              i)  Interactive=Yes ;;  # Use dialogue
19              s)  Signo=$OPTARG ;;    # Store signal number
20              \?) echo $Usage >&2 ; exit 1 ;; # Unrecognized option
21          esac
22      done
23      shift `expr $OPTIND - 1`        # shift options away
24  else    # getopts not available
25      while [ $# -gt 0 ]; do  # while there are arguments remaining
26          case $1 in
27              -i) Interactive=Yes ; shift ;;
28              -s) if [ -z "$2" ]; then
```

continued

stored in the **EXCLUDELIST** variable so it only needs to be changed in one place and can be easily referenced later in the script. Lines 11-14 verify the accessibility of the exclusion list file, and if it does not, an error message is displayed and the script terminates.

For portability reasons, both the BSD and AT&T-like **ps** commands are supported because each recognizes different option sets. To determine the UNIX version, test the name of the operating system kernel: if it's **/vmunix**, a BSD or SunOS **ps** command is being used, oth-

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erwise, an AT&T-like **ps** is assumed.

Next a list of hosts is generated by determining all networked hosts known by the local machine and then excluding those listed in the exclusion file. If the local machine runs **ypbind**, it is an NIS client which means the hosts database on the NIS server can be displayed using **ypcat**. Otherwise, you would examine the local **/etc/hosts** file for known networked hosts.

The excluded hosts are removed from the list of known hosts with the **fgrep** command with the **-v** option, which tells **fgrep** to match all entries except those in the exclude file.

Finally, the **rwall** command is invoked with the resultant host name list. This command expects input from its standard input file. If invoked as shown in Listing 1D, you would enter a message from the keyboard and end input by typing <Ctrl-D>. If you already have a prepared "speech" stored in a file, you could invoke **writenet** as shown in Listing 1E to discard standard output prompts, and take standard input from your "message" file. Standard error messages would still be displayed on your terminal.]

Greg DeRenne
Scotts Valley, Calif.

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The Terminator

Dear Dr. Thomas:

I'm submitting a simple shell script called **zap** that allows you to signal processes for which you don't know the process-id number, but do know the name, associated terminal, owner, or other information appropriate for pattern matching in the **ps** output listing.

I find **zap** useful for terminating a set of related processes with one command line, instead of using the standard approach of running **ps** to list all processes, selecting the appropriate candidates, then constructing the proper **kill** command line. If you run **zap** carelessly you could terminate processes by mistake, but if you specify the interactive (**-i**) option, **zap** will prompt you with information about each process before signaling it.

The default signal is software termination. However, you can designate a different signal by specifying its number as the argument to the **-s** option. Signal numbers are generally documented in the

Listing 2 continued

```
29                      echo "-s option requires an argument" >&2
30                      echo $Usage >&2 ; exit 1
31                  else
32                      Signo=$2 ; shift 2
33                  fi ;;
34              --) shift ; break ;;
35              -*) echo "Unrecognized option \"$1\"" >&2
36                  echo $Usage >&2 ; exit 1 ;;
37              *)  break ;;
38          esac
39      done
40  fi
41  # Make sure any specified signal number is numeric:
42  expr $Signo + 0 >/dev/null 2>&1 # discard output
43  if [ $? -eq 2 ]; then   # expr returns 2 for invalid expressions
44      echo "-s option arg not an integer" >&2
45      echo $Usage >&2; exit 2
46  fi
47  # Process command-line arguments:
48  case $# in  # check number of remaining arguments
49      0)  echo "$0 requires a pattern argument"
50          echo $Usage >&2 ; exit 1 ;;
51      1)  Pattern=$1 ;;   # remaining argument is specified name
52      *)  echo "Too many arguments"
53          echo $Usage >&2 ; exit 1 ;;
54  esac
55  # Determine Unix version for proper ps command:
56  if [ -f /vmunix ]; then # BSD/SunOS have this kernel name
57      Ps_opts=-auxww  # Use options for BSD
58  else
```

continued

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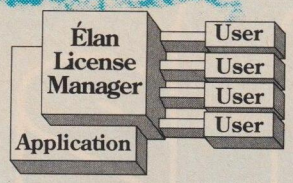

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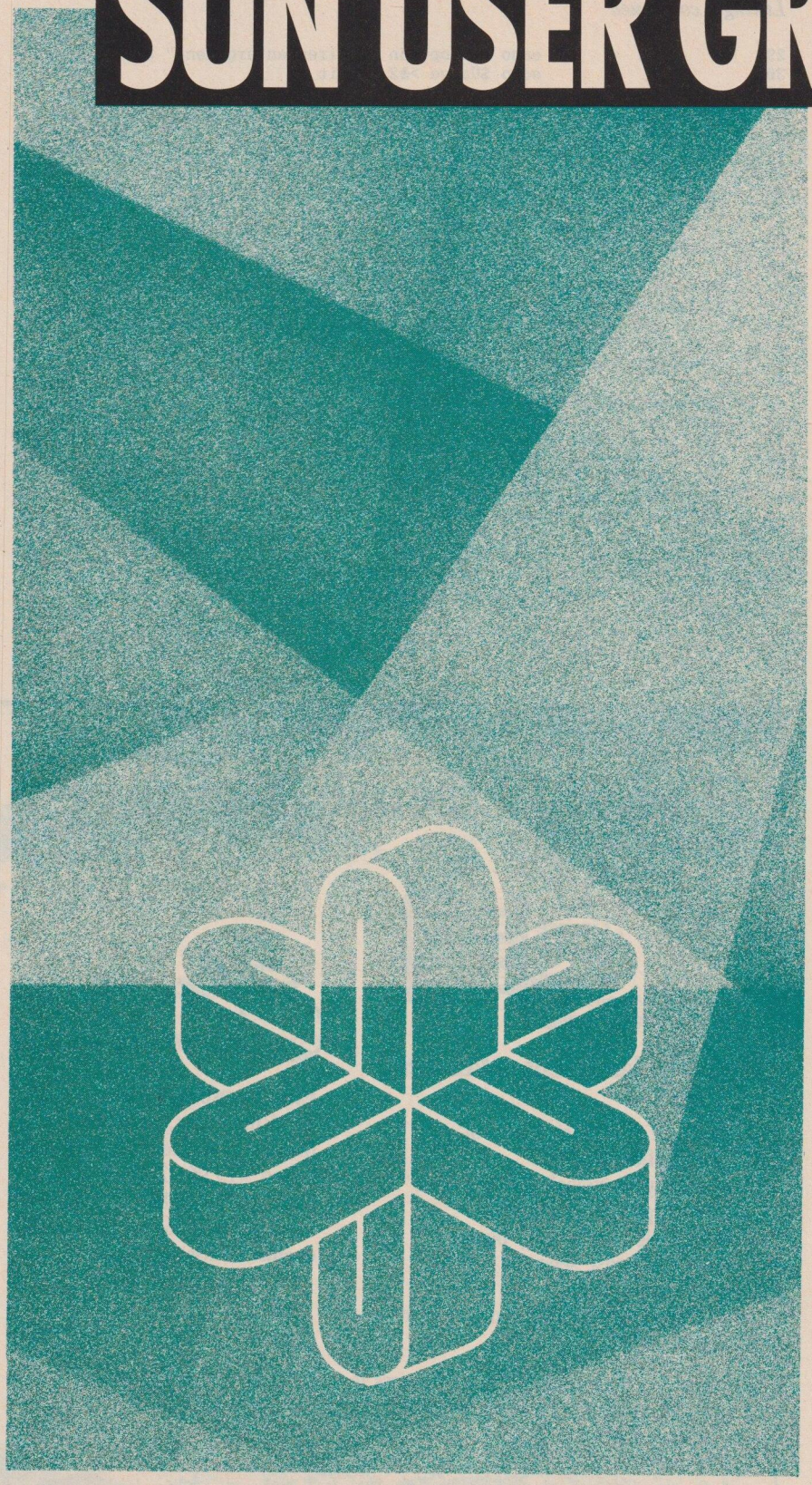

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/usr/include/signal.h header file.

[*Doctor's note:* Part A of Listing 2 shows the **zap** script. Parts B, C, and D illustrate sample usage.]

[*Doctor's explanation of* **zap** *operation.* The first part of the script defines several variables. **Interactive**, acts as a flag to indicate interactive or dialogue mode if not null or non-interactive operation if it's null. **Ps_path** is initialized to the full path name for the **ps** command. This is necessary so that instances of **ps**, other than the one invoked in this script, won't be filtered out from consideration–as long as they aren't invoked with the same (full) path name. **Signo**, storage for the signal number, is set to 15 for the default case. **Tmpfile** defines a temporary file used to contain **ps** output for convenient processing. **Usage** defines the correct usage message to invoke the script. The "preamble" section ends with the **trap** command which arranges for erasure of the temporary file when the script terminates.

Next, command-line options are processed with the **getopts()** routine, if it's available. This library routine supports the Command Syntax Standard, which I encourage so UNIX utilities have a consistent command-line syntax. The **getopts()** function is explained in my August 1991 column, so I won't repeat it here. Any current book on shell programming should have a discussion as well.

If **getopts()** isn't available, the "while" loop in lines 25-39 processes each argument in turn. The argument under scrutiny (in **$1**) is examined by the enclosed "case" statement (analogous code also explained in my August 1991 column). Lines 42-46 check to make sure that the user-specified signal number is numeric. If the signal is not numeric, error messages are displayed and the script exits.

The "case" statement on lines 48-54 checks the command-line argument count. This count should be one (**1**) and correspond to the pattern argument. If so, the regular expression pattern is stored in the **Pattern** variable (line 51).

The "if" test in lines 56-60 determines whether the system is BSD-derived. Lines 62-66 determine the "flavor" of the **echo** command–one flavor uses the **-n** option to suppress the newline and the other uses a "\c" escape sequence. If **echo** recognizes the **-n** option, then **echo -n** will produce no output, causing the subsequent **egrep** command to fail. The script initializes variables **Echo_opt** and **Echo_arg** appropriately for the **echo** command the script will use.

The remainder of the script runs **ps** and processes the result. The output is stored in a temporary file, the heading

Listing 2 continued

```
59      Ps_opts=-ef     # Use options for AT&T-like ps
60  fi
61  # Determine which echo command will be used:
62  if echo -n | egrep -e -n >/dev/null 2>&1; then  # if -n output
63      Echo_opt=""  Echo_arg="\c"  # AT&T-like echo
64  else
65      Echo_opt="-n"  Echo_arg=""  # BSD echo recognizes -n as option
66  fi
67  # Now process ps command output:
68  $Ps_path $Ps_opts >$Tmpfile     # store ps output
69  Heading=`sed 1q $Tmpfile`       # capture heading (first) line
70  egrep $Pattern $Tmpfile     |   # select named processes
71  sort +1nr -2                |   # sort in reverse by Pid field
72  egrep -v `basename $0`      |   # ignore this process
73  egrep -v "$Ps_path $Ps_opts"|   # ignore previous ps process
74  while read Line ; do            # read each line
75      if [ -n "$Interactive" ]; then  # if using dialogue mode
76          echo "      $Heading"   # display heading
77          echo $Echo_opt "Signal: $Line (y/n)? $Echo_arg"
78          read ans </dev/tty
79          case "$ans" in
80              [Yy]*) ;;   # will send signal
81              *)  continue ;; # read next line of ps output
82          esac
83      fi
84      set `echo $Line`        # Place fields in positional params
85      kill -$Signo $2         # Second field contains PID
86  done
87  exit 0
```

continued

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Listing 2 continued

B. Use of **zap** *to signal a specific process showing the target* **ps** *entry before and after termination:*

```
# ps -auxww ¦ grep ypbind ¦ grep -v grep
bin         59  0.0  0.0   36    0 ?  IW   12:50   0:00 ypbind
# zap ypbind
ypbind: going down on signal 15
# ps -auxww ¦ grep ypbind ¦ grep -v grep
# ▮
```

C. Use of **zap** *to log out a user (*`beccat`*). This approach is especially useful if the user is logged into multiple terminals, windows, or virtual terminals:*

```
# zap -s 1 beccat
#▮
```

D. Use of **zap** *to terminate a hung editor process running on a virtual terminal. (On this system the virtual terminal devices are named /*`dev/vt01` *through /*`dev/vt08`*). The regular expression pattern argument is in single quotes to prevent the shell from interpreting it.*

```
# zap -i 'vt0[1-8]'
          UID   PID  PPID  C    STIME TTY      TIME COMD
Signal: beccat  1674  1099  0 17:46:30 vt05    0:01 vi zap (y/n)? y
          UID   PID  PPID  C    STIME TTY      TIME COMD
Signal: beccat  1309  1304  0 15:46:09 vt05    0:04 -ksh (y/n)? n
 ...
# ▮
```

line is extracted with the **sed** command shown in line 69, and on line 70 the file is searched for the user-specified pattern.

Any output is piped into **sort** and arranged in descending order by the second field, which corresponds to the process-id number. The script orders the processes from highest to lowest process-id number so that child processes are killed before their parents.

Lines 72 and 73 filter out any processes associated with the operation of **zap** so they won't confuse the operator. The result is piped into the "while" loop, so that **zap** can process each entry separately. If line 75 detects that interactive mode is enabled, lines 76-83 are executed and prompt the user with two lines of information for each **ps** entry–the first is a heading that identifies the fields of the **ps** output entry that's displayed on the second line. If the user answers the prompt with anything that doesn't begin with "y" or "Y," control passes back to the beginning of the "while" loop, which processes the next **ps** entry, if any, from the pipeline. If the user elects to signal the process, control will drop through the "case" and "if" statements.

Line 84 places each field of the **ps** entry line into shell positional parameters named **$1**, **$2**, and so on. The second field is referenced by line 85, which is the **kill** command line used to actually signal the designated process. After all selected **ps** entries have been processed, the "trap" set on line 13 is sprung, the temporary file is erased, and the script exits.

Regarding signaling processes, you should start with software termination, signal 15. Many programs are designed to catch this signal and "clean up" by erasing any temporary files before termination, unlike "sure kill" (signal 9), which would leave temporary files behind to clutter up the disk. If the termination signal is ignored, try the hangup signal (1), which is generally not caught nor ignored–even by shells. Finally, after all else fails, try the "sure kill" signal which can't be caught or ignored. However, even "sure kill" may not terminate a process if it is already dead and exists as a zombie process, which still has a kernel-resident process table entry although all other resources have been deallocated. This occurs when the process' parent process didn't wait for it. Other processes that cannot be killed occur when the process is sleeping at an uninterruptible priority and waiting on a resource that hasn't been made available.]

George Chiesa
Milan, Italy

continued

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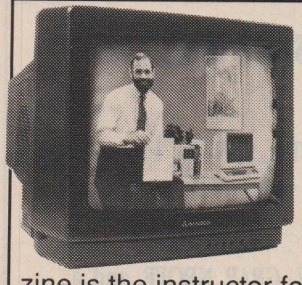

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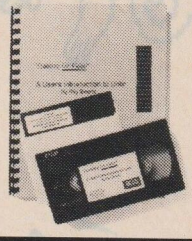

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Start with a Clean Slate

Dear Dr. Thomas:

There's a problem with the **stubs** program published in your May 1991 column. You should add a line to "zero out" the **command_line[]** array before you use it. That is, after line 56 and before line 59, add:

```
*command_line = '\0';
```

Because this array is local to **main()** it is not guaranteed to be null and may therefore contain garbage characters as it does on my SPARC machine. The **strcat()** routines on lines 60 and 61 will overwrite arbitrary parts of the stack. The **printf()** function on lines 93 and 94 sends the resulting mess to the standard output.

Dick Grune
Amsterdam, Netherlands

Submissions

Mail Bourne/Korn shell scripts, C programs, or tips to ease the burden of system administrators, programmers, and users to "Wizard's Grabbag," *UNIXWORLD*, 444 Castro St., Mountain View, CA 94041; send e-mail submissions to **uunet!uworld!grabbag** or **grabbag@uworld.com**. Requests for submission guidelines should be sent to the same addresses or can be downloaded from UUNET with the following pathname: **uunet!~ftp/published/unix-world/grabbag/README**. If we print your contribution, you will be sent $50 within 60 days of publication.

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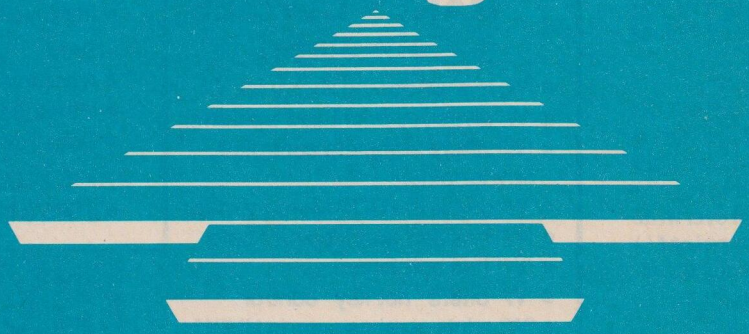

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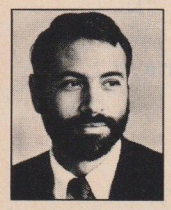


MORE DOLLARS AND CENTS, cats AND TWO-LINE PROMPTS

In this column, I usually answer three questions and, if space permits, have one item of feedback. However, my July and May 1991 columns generated more feedback than usual, so I am reversing the trend this month: three feedback responses and one question.

Michael Loukides comments on my suggestion that round-off error can be eliminated in monetary calculations by using data type **double** or a specialized data structure comprised of integers. In the other two feedback letters, Pat Wood finds more alternatives to the **cat** command, and Walter Mecky points out some additional information on signals. Timothy Prime asks how to create a multiline shell prompt.

Michael's Two Cents

Comment: The second paragraph of the "It Makes Cents to Me" item in your July 1991 column contains a critical mistake. I can't resist adding my own two cents.

You write "When dealing with dollars and cents, you only have to worry about errors large enough to affect hundredths of a dollar." This is incorrect. To handle very accurate financial computations, financial transactions must be handled with *many* digits behind the decimal point–I've seen as many as seven.

I suspect that 10 or so digits beyond the decimal point are commonly used–particularly if the application is portfolio management or financial modeling. Why? Introduce penny-sized round-off errors in a large compound interest calculation and the results will be off by a substantial amount very quickly.

Given these constraints, use of the **double** data type isn't sufficient. Let's assume that you only need five digits beyond the decimal point. In this case, the 10 digits of precision that ANSI guarantees for **double** don't even suffice for personal banking, because the five digits in front of the decimal point can, at most, represent $99,999.99. While that's more than I have in my bank account, it's not enough to compute the mortgage on my house, let alone the sort of calculation a Fortune 500 company might require.

If you're going to perform 500,000 to 750,000 computations on your data, your assumption that **double** provides "at least 12 significant digits" is unwarranted. Using 128-bit floating point, or **long double**, may solve some problems, but, as you said, it's rarely implemented. I suspect that you'd push the limits of quad-precision quickly.

There's only one solution to Mr. Wooldridge's problem: define your own data structure based on integers and write your own package to do arithmetic on it. Essentially, you need to concoct your own data representation to meet certain requirements: fixed-point, five or more digits to the right of the decimal, an arbitrary number to the left; and preferably extendible, so the package can compute the gross national product in Italian lire.

The arithmetic package you present in your July column is the right idea. For serious financial applications however, one would eventually need to write an entire library, including functions to do compound interest, depreciation, "present value of 1," and other computations performed by financial wizards.

In addition, you would need to support multiplication by a genuine floating-point number such as an interest rate. You'd need exponential, logarithm, and probably gamma functions.

The real lesson from this is that the UNIX community desperately needs to understand the requirements of users outside of our community–in this case, the financial community. Inability to do so is one of the factors slowing the acceptance of UNIX. If we can't at least understand the issues involved, people like Mr. Wooldridge and companies like his are going to stay with VMS, CMS, and the others to provide solutions to his problems.

Michael K. Loukides
Guilford, Conn.

Response: Mr. Loukides brings up several significant points: some I agree with, some

LISTING 1: Amortization tables can be calculated in C using the double data type.

```
#include <stdio.h>
#include <math.h>

#if __STDC__ !=1
char *gets();
#endif

main()
{
     double balance;        /* amount owed */
     double rate;           /* monthly interest rate paid */
     double months;         /* number of months to pay off loan */
     double interest;       /* amount of interest each month */
     double payment;        /* monthly payment */
     double principal;      /* amount paid on principal each month */
     int count = 0;         /* counts months paid */
     char instr[30];        /* data entry string */


     printf("Enter current loan balance: ");
     if (gets(instr) == NULL)
         exit(1);
     balance = atof(instr);
     if (balance <= 0.00) {
         fprintf(stderr, "Balance must be positive\n");
         exit(1);
     }
```

continued

I don't. One of the serious shortcomings of C, and therefore of UNIX, is its inability to handle large financial calculations to the penny. Aside from **double**, C doesn't provide an acceptable data type to represent dollars and cents. As Loukides and I note, **double** only works when the numbers are relatively small. Another problem is formatting. For example, there is no option to the **printf()** function that automatically inserts commas into numbers. Note that **scanf()** will fail if it reads a number containing a comma.

Let's face it, C is not well-suited to writing financial applications. A similar analysis would conclude that Cobol isn't the best choice for scientific computing. This is not to say that C can't handle financial programming or that Cobol can't be used in scientific applications. It's more a question of how much time must be spent writing support routines to provide the functionality that the underlying language or libraries don't have. As Loukides points out, it is C's inability to handle dollars and cents well that is one of the factors slowing the acceptance of UNIX in the marketplace.

One of the criticisms Loukides has is that "financial transactions are routinely handled with many digits behind the decimal point." However, this is true only for certain types of applications. It makes no sense to use extra decimal precision in accounting systems concerned only with cents and not fractions thereof. This is what prompted my comment that precision to only hundredths of a dollar is necessary in accounting applications–a statement I still believe is accurate.

Using a mortgage calculation as an example, Loukides suggests that several decimal digits are needed in financial calculations. I don't agree. I was able to recreate my mortgage amortization table, the same as the one provided by my bank, with the **amort** program in Listing 1. The program prints mortgage amortization tables when given the amount borrowed, yearly interest rate, and term of the loan in months. Data type **double** is used to represent the mortgage amount and needs no more than two digits of decimal accuracy. In fact, to make it fit the table provided by my bank, I had to round the interest off to the penny before calculating each new loan balance (line 54).

It is worth noting that originally I used the full **double** value for the calculated interest (line 52). This exactly liquidates the loan amount in the stated number of months, but doesn't match the amortization schedule provided by my bank. I discovered that the bank's schedule rounds the interest charge to the nearest cent before determining how much of a payment goes to principal reduction. When I added line 54 to **amort**, my table matched the bank's exactly.

Accounting systems aside, it has been my experience that exact financial results are only needed when the figures are relatively small. As the numbers get larger, smaller denominations are ignored. The U.S. GNP is reported in trillions of dollars. The U.S. Federal budget deficit is rounded to the nearest hundred million. No one tries to, or would want to, calculate these numbers to the penny.

What's more, I can't imagine why anyone would want to include pennies on the output of a financial model–they simply aren't that precise. My guess is that such models use five or six digits to the right of the decimal point because they are manipulating numbers representing billions or even trillions of dollars. These models don't need a separate **dollar** data type.

Without question, many computer applications require results that must total exactly. I still believe that many of these

Listing 1 continued

```
28      printf("Enter current loan rate (enter 10%% as .10): ");
29      if (gets(instr) == NULL)
30          exit(1);
31      rate = atof(instr) / 12.0;  /* convert to monthly rate */
32      if (rate <= 0.00) {
33          fprintf(stderr, "Interest must be positive\n");
34          exit(1);
35      }
36      if (rate >= 1) {
37          fprintf(stderr, "Interest must be less than 1\n");
38          exit(1);
39      }
40      printf("Enter length of loan in months: ");
41      if (gets(instr) == NULL)
42          exit(1);
43      months = atof(instr);
44      if (months <= 0) {
45          fprintf(stderr, "Loan length must be positive\n");
46          exit(1);
47      }
48      printf("     %10s\t%10s\t%10s\t%10s\n", "Balance", "Interest",
49            "Prin. Red", "Payment");
50      payment = balance * (rate / ( 1 - pow(( 1 + rate ), -months)));
51      while (balance > 0) {
52          interest = balance * rate; /* interest owed this month */
53          /* round-off to nearest penny */
54          interest = ( (int) (interest * 100 + .5)) / 100.0;
55          principal = payment - interest; /* amount paid off */
56          balance -= principal;     /* new balance */
57          printf("%3d. %10.2f\t%10.2f\t%10.2f\t%10.2f\n",
58                  ++count, balance, interest, principal, payment);
59      }
60      exit(0);
61  }
```

TABLE: Pat Wood's list of commands that do the same thing as cat

col *as long as you don't have reverse line feeds in your input*

cc -E *as long as you don't have lines that start with #*

m4 *as long as you don't have macros in the text*

diff -e /dev null filename *puts "0a" at the top and "." at the end*

echo "`< filename`" *this only works on* **ksh** *and is sort of cheating; only works on files smaller than the maximum argument length limit–about five to 10 kilobytes*

fgrep *and* **egrep** *will work the same as* **grep**

echo "1,$p" ¦ ed name *also works with ex*

compress < filename ¦ uncompress

crypt x < filename ¦ crypt x

LISTING 2: The C shell and the Bourne/Korn shells handle newlines in prompts differently.

A. Setting the C shell's prompt:

```
% set prompt = 'May I help you? '
May I help you? ▮
```

B. Unquoted newlines terminate C shell command lines:

```
% set prompt = 'line 1
Unmatched '.          C shell error message
```

C. The proper way to define a two-line prompt:

```
% set prompt = 'line 1\
line 2 '
line 1
line 2 ▮
```

D. Setting a two-line prompt in the Bourne/Korn shells:

```
$ PS1='line 1
> line 2 '
line 1
line 2 ▮
```

programs can use **double** and, if implemented, **long double** to do so. However, this still leaves the problem of working with large dollar amounts.

Loukides and I agree that the only way to handle such data is with a derived type, such as a structure in C or class in C++. We disagree on what to put in the library. I don't see the need for an **exp( )** function that calculates in dollars. The result of the current **exp( )** library function and a function that multiplies a **dollar** value by a **double** variable should suffice.

I'd like to get more information on this topic. I am interested in knowing how companies that write financial programs in C handle the round-off error problem. Also, are there any commercially available financial libraries? Is anyone even doing this work in C? I look forward to your replies.

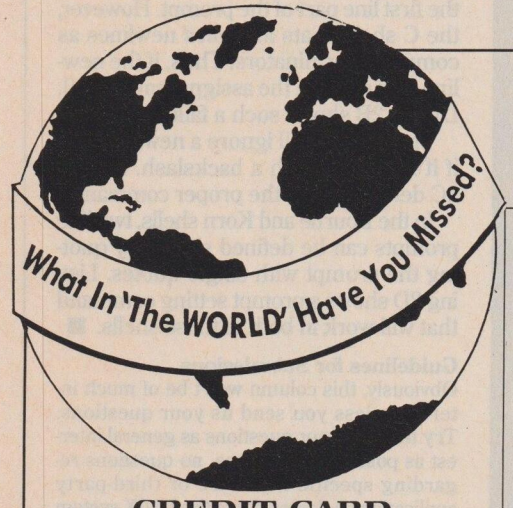
Raining cats and cats

I read your article on alternatives to **cat** and was intrigued. This is the kind of teaser that keeps me up at night. I've sent along nine other alternatives (listed in Table).

Pat Wood
Morris Plains, N.J.

Responding to My Signals

Comment: What you wrote in your column about reliable signals was correct, but not quite complete. You left out the



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Posix definitions that have been adopted by X/Open. Besides **sigvec(2)** in BSD and **sigset(2)** in System V Release 4 (SVR4), there are the Posix call **sigprocmask()** and partners in SVR4 and most SVR3 versions of UNIX.

Another point that needs clarification is that the restarting of system calls after an interruption is explicitly termed "implementation defined" in Posix. You wrote in your May 1991 column that "current UNIX versions can restart system calls after a signal is handled." This is definitely untrue for most existing SVR3 versions and in BSD-derived systems, an application can choose whether to restart them or not.

Walter Mecky
Buettleborn, Germany

Response: My comment about restarting interrupted system calls was based on SVR4.

Two-Line Prompts

Question: I have been trying to create a multilined prompt in the C shell without success. Is it possible to create one?

Timothy D. Prime
Waterloo, Ontario, Canada

Answer: The only difference between creating single-line and multiline prompts in the C shell is the proper quoting. In your case, the difficulty comes from the way the C shell handles newlines.

You can define a new prompt for the C shell by assigning the variable **prompt** a different prompt string. By default, **prompt** holds "%". Listing 2A shows the C shell command that changes the prompt to the more respectful "May I help you?"

In order to define a two-line prompt, you must make the newline at the end of the first line part of the prompt. However, the C shell treats *unquoted* newlines as command terminators. Thus, if the newline isn't quoted, the assignment will fail. Listing 2B shows such a failure.

The C shell will ignore a newline only if it is quoted with a backslash. Listing 2C demonstrates the proper command.

In the Bourne and Korn shells, two-line prompts can be defined simply by quoting the prompt with single quotes. Listing 2D shows a prompt setting command that will work in both of these shells. ■

Guidelines for Submissions

Obviously, this column won't be of much interest unless you send us your questions. Try to make your questions as general-interest as possible, and please, no questions regarding specific hardware or third-party application packages. State the UNIX system version, if applicable, for the question at hand. Send your questions to Ray Swartz, "Answers to UNIX," c/o *UNIXWORLD*, 444 Castro St., Mountain View, CA. 94041. Fax them to 415-967-1257. Send them via e-mail to: **uunet!uworld!ans2unix** or **ans2unix@uworld.com**

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Ray Swartz is the founder of Berkeley Decision/Systems, which specializes in C and UNIX training. His first book discusses using C for business applications, and his second book teaches shell programming using business-related examples.

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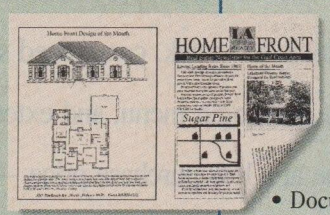

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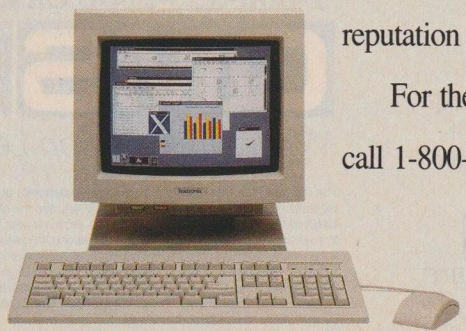

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Does everybody think Suns run too slowly? Legato Systems has its Prestoserve board and Omni Solutions has its 400 network coprocessor, both of which are designed to accelerate Sun Microsystems servers. Now Ceram has devised the Turboswap board to accelerate Sun workstations. It's designed to speed UNIX virtual memory paging and swapping operations. Ceram claims that, depending on the application, performance will improve by a multiple of two to 30.

The card uses a proprietary software driver that communicates with the SunOS 4.x operating system kernel. The driver also supports Sun's temporary file system type so that files can be stored on the board for faster access. Ceram claims that because the board eliminates the need for a fixed disk swap partition, it frees up disk space for other data. The company also anticipates that the board will be used in diskless workstations to decrease or eliminate swapping of data over the network.

The SBus-based TurboSwap card comes in two models, one with 40 megabytes of paging and swap space, priced at $1,745; and the other with 80 megabytes of swap space, priced at $3,395. You can install as many SBus cards as your SPARCstation has available slots. **Ceram, 2260 Executive Cir., Colorado Springs, CO 80906; 800-237-8600 or 719-540-8500.**

Circle No. 301 On Inquiry Card

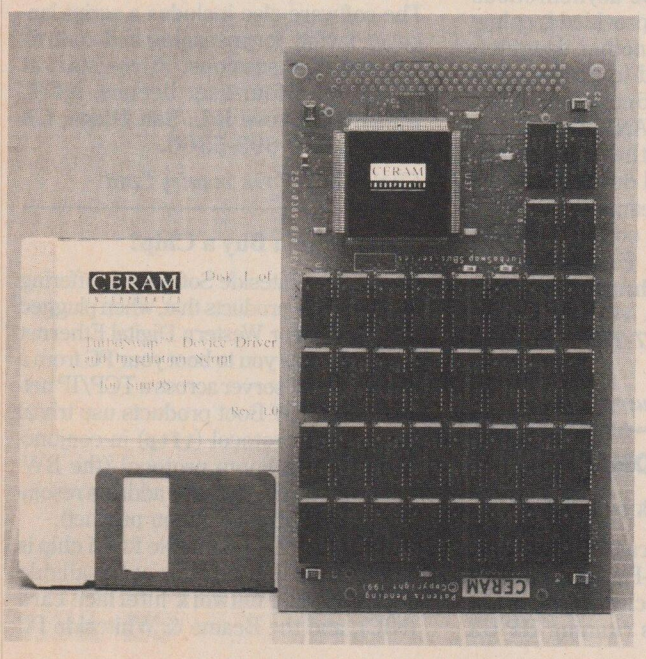
Pens and Portables Together?

Tusk, a Florida-based manufacturer, has released a laptop computer that incorporates a multitude of features. Dubbed the All-Terrain Super Tablet, it's a six-pound ruggedized laptop that lets users input by pen and keyboard. A pen-based version of UNIX for laptops is reportedly under development at SRI in Menlo Park, Calif. In addition to UNIX, it will run DOS, OS/2, Go Corp.'s PenPoint, and Microsoft's PenWindows on a Hitachi screen with resolution of 1024-by-768 pixels. The laptop uses the Intel 386SL processor, which is designed for machines that need lower power consumption.

In order to achieve ruggedization standards, Tusk has hard-wired components within the casing, including eight megabytes of RAM and an RSA fax/modem. The casing, said to be bullet-proof, is fashioned from Du Pont Kevlar. Other components include handwriting recognition capabilities developed by Nestor and a Gazelle Graphics pen and digitizer.

The company anticipates interest from government, military, and commercial users who work outside traditional offices. Prices for the tablet start at $6,500 each or $5,500 in larger quantities. **Tusk, 1310 Gateway Rd., Ste. 201, Lake Park, FL 33403; 800-275-8875 or 407-881-9050.**

Circle No. 302 On Inquiry Card



Ceram's SBus-based TurboSwap accelerator card is designed to at least double the performance of Sun Microsystems workstations. The card comes in two models–one with 40 megabytes of swap space for $1,745 and the other with 80 megabytes of swap space for $3,495.

And Some Potpourri for Good Measure

Specialized Systems Consultants is a Seattle, Wash. consulting firm that has done everyone in the UNIX marketplace a favor by printing reference cards small enough to fit into a number-10 envelope. The cards contain basic reference information about UNIX programming techniques, including information on `vi`, shells, and command summaries. The collection's latest contributions include an ANSI C Reference Card recently revised to reflect the finalization of the ANSI C standard. Examples and specifications illustrate ANSI C, including statement formats, functions, constants, and preprocessor commands. Price of the eight-page card is $3.00.

Also available is a Korn Shell Reference Card and a C++ 2.0 Reference Card. The 20-page Korn Shell card documents command line editing features covering both `vi` and `emacs`, and a summary of built-in commands and variable substitutions. The 16-page C++ 2.0 card explains C++ topics including objects, classes, and inheritance by example. The Korn Shell and C++ 2.0 cards are $4.50 each. **Specialized Systems Consultants, P.O. Box 55549, Seattle, WA 98155; 800-FOR-UNIX or 206-527-3385.**

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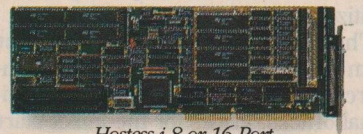

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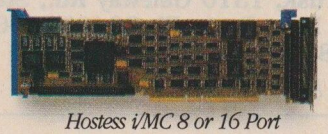

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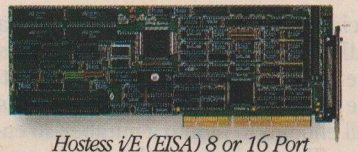

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CIRCLE NO. 213 ON INQUIRY CARD

BOARDS

Dots Fast

Visual Information Technologies has developed a new series of three SBus-based boards to accelerate display performance on SPARCstations. The RasterFlex-32 ($3,995) is a single-slot SBus board combining 24-bit color with eight bits for graphic overlay; it also allows an eight-bit "pseudocolor" display, so that eight-bit and 24-bit windows can be simultaneously displayed on the screen. Applications running under X Version 11 Release 4, Open Windows 3.0, and SunView will run unchanged with the board.

The RasterFlex-8 ($1,895) is a single-slot grayscale board. Both it and the RasterFlex-32 are for resolutions of 1152-by-900 or 1024-by-1024, while the RasterFlex-hr ($5,895) is a double-slot board for higher resolutions of 1280-by-1024. **Visual Information Technologies, 3460 Lotus, Plano, TX 75075; 214-596-5600.**

Circle No. 304 On Inquiry Card

Stallion Rides Onboard

Stallion Technologies has developed a multiport card with a 32-bit data path for the extended industry architecture (EISA) slot of Intel 386- and 486-based PCs. The Onboard/E uses a 16-MHz 80C186 processor to offload terminal I/O processing from the host PC in a multiuser system. Configured by software, it eliminates the need for dip switches and the possibility of conflicts with other boards installed in the PC.

The Onboard/E can be configured to handle from four to 32 asynchronous ports, with expansion provided by plug-on daughterboards. Another daughterboard can be ordered to get two synchronous ports for X.25 connectivity to a wide-area network (WAN). As with other Stallion boards, the Onboard/E comes with a protocol development kit based on AT&T's Streams protocol for programming custom communications in a UNIX network. Prices start at $1,075. **Stallion Technologies, 985 University Ave., Ste. 16, Los Gatos, CA 95030; 800-347-7979 or 408-395-5775.**

Circle No. 305 On Inquiry Card

COMMUNICATIONS

Getting MPE to Talk to HP-UX

Just as DOS clients can talk to UNIX servers, now Hewlett-Packard's proprietary MPE-based machines can act as clients to HP servers running HP-UX over a TCP/IP network. NSD's InterTask software lets you integrate MPE and HP-UX production scheduling using MPE tools in such a way that the InterTask client can execute remote HP-UX processes. According to NSD, the software can be used for both online and batch application interfaces.

When used in conjunction with HP's Network Services, InterTask allows a single MPE-resident program or job stream to extract data from one operating system, transfer the data over a network, and load the data into an application residing under the other operating system. The HP 3000 client software can be used to execute a single process or series of processes on multiple HP 9000 nodes. Price is dependent on CPU, ranging from $300 for the low-end HP 9000 to $3,750 for the high-end HP 3000. **NSD, 1400 Fashion Island Blvd., 4th Flr., San Mateo, CA 94404; 415-573-5923.**

Circle No. 306 On Inquiry Card

Getting NCR to Talk to SNA

NCR has developed DynaComm/Elite software in conjunction with Network Software Associates (NSA) for what may sound like a complicated task: letting a user emulate an IBM 3270 terminal on a Microsoft Windows 3.0 desktop, communicating through a UNIX-based System 3000 server over TCP/IP to an IBM SNA network. While the DynaComm/Elite software runs on the Intel-based desktop, the SNA protocol stack runs on the server. Up to five concurrent 3270 sessions can be supported and can be a mix of screen and printer sessions. The software also includes a script language facility for managing and controlling multiple sessions. Prices start at $3,500 for a four-user license. **NCR, 9900 Old Grove Rd., San Diego, CA 92131; 619-693-5300.**

Circle No. 307 On Inquiry Card

Pssst, Wanna Buy a Chip?

Beame & Whiteside Software is offering two firmware products that, when plugged onto a 3Com or Western Digital Ethernet card, will allow you to boot your PC from a remote UNIX server across a TCP/IP network. The BW-Boot products use trivial file transfer protocol (`tftp`) in conjunction with the bootp protocol (the BW-Bootp product) or reverse address resolution protocol (the BW-Bootr product).

Once the programmable ROM chip is installed in the appropriate available socket on the network interface card (NIC), and the Beame & Whiteside PC

boot software is loaded onto the file server, the PC can boot directly from the server. The server recognizes the NIC's Ethernet address and returns the PC's internet protocol address information. According to the company, network login can be scripted so that it is transparent to the user, or so that the user can select specific configurations and connectivity options. Retail price for the firmware is $50. **Beame & Whiteside, P.O. Box 8130, Dundas, Ontario, Canada L9H 5E7; 416-648-6556.**

Circle No. 308 On Inquiry Card

DATABASE SOFTWARE

Over the River and Through the Database

WordMarc has developed a way for users of its Composer+ word processing software to access company databases. Its new DataMarc software works in conjunction with the word processor to allow users to hot-key from a document to the database without having to learn SQL statements or a 4GL. A menu-driven, point-and-click interface lets the users build their own queries, utilizing a variety of selection, sorting, and arithmetic functions.

WordMarc's list of accessible databases includes more than two dozen database applications running UNIX, DOS, or other operating systems. Price for DataMarc ranges from $2,400 to $11,255, depending on the platform. Platforms include UNIX System V, XENIX, AIX, MIPS' RISC/os, HP-UX, and SPARC. **WordMarc International, 940 E. Meadow, Palo Alto, CA 94303; 415-813-8989.**

Circle No. 309 On Inquiry Card

NETWORKING

Managing Unisys

Combining UNIX, database technology, and Open Systems Interconnection (OSI), Unisys has developed a network management system for Unisys networks. For hardware, the Common Network Management System (CNMS) uses two Unisys U-6000 machines, one acting as a server and another as the clients (X terminals can be used for additional clients). For software, CNMS uses OSI's common management information protocol and Oracle's relational database management system. The system is designed to keep track of mainframe computers, communications processors, multiplexers, data files, programs, and other devices in the network.

Features of the CNMS software include fault management, configuration management, trouble ticketing, and the ability for management information systems directors to create their own "areas of interest." The fault management capability filters, correlates, and prioritizes alarms and events, reporting the most important ones as "incidents." The configuration management capability keeps track of the network arrangement by maps, management information base listings, and change reports. The trouble tickets generated are stored in the Oracle database so that problems can be tracked and the solutions kept for future access. CNMS can also communicate with AT&T's Accumaster Integrator network management software. Cost is $140,000 for both U-6000s and a variety of network management software. **Unisys, P.O. Box 500, Blue Bell, PA 19424; 215-986-3093.**

Circle No. 310 On Inquiry Card

The Magic Number is 3

Cisco Systems has devised a way to link your Ethernet or FDDI network into high-speed T3–or E3 if you're outside the United States–data communications links. Cisco's HSSI (high-speed serial interface) card, installed in its AGS+ brouter–part bridge, part router–allows you to create communications links between networks running at 45 megabits per second, or 34 mbps if you're outside the United States.

The HSSI board features a synchronous serial interface, two 16-mips processors, and a 52-mbps maximum data rate. It links to an external device that provides clocking and frame synchronization functions for the data sent over T3/E3 lines from several third-party vendors. Price of the board is $8,000. **Cisco Systems, 1525 O'Brien Dr., Menlo Park, CA 94025; 415-326-1941.**

Circle No. 311 On Inquiry Card

POTPOURRI

Avoiding Assault on Battery

For all those whose UNIX operating systems from The Santa Cruz Operation or Interactive are having a power struggle with their portable Intel 386SX-based computers, Micronote has developed a solution. Its Pmix

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power management software is designed to extend the battery life in your portable as much as possible. It transmits warnings prior to the battery dying, powers down the screen and hard disk during inactivity, slows the processor down to 10, five, or 2.5 megahertz during inactivity or use, and configures the notebook for slow-refresh, low-power dynamic RAM.

In addition, it can reconfigure UNIX so that it does not automatically power-up the hard disk every five minutes. Micronote anticipates similar battery life under UNIX using Pmix as you would get running DOS. Price is $99. **Micronote, 1652 Calle Turquesa, Newbury Park, CA 91320; 805-499-4621.**

Circle No. 312 On Inquiry Card

More SBus Boxes

Hot on the heels of Texas Microsystems and Aurora Technologies, Integrix has introduced an SBus expansion box to add additional SBus-based cards to a SPARC-compatible workstation. The SEC 100 expansion chassis can also accommodate SCSI drives–two 3 1/2-inch drives or one 3 1/2-inch drive and one 5 1/4-inch drive. The required hardware to install various tape, disk, or optical drives is available optionally. Price is $1,950.

Integrix has also developed two SBus-based color frame buffers. One offers resolution of 1152-by-900 or 1280-by-1024, and the second offers resolution of 1152-by-900 and 1024-by-768. According to Integrix, this frame buffer allows you to use older, fixed-frequency color monitors or new multiscan SuperVGA monitors. **Integrix, 3001-A W. Mission Rd., Alhambra, CA 91803; 818-300-8828.**

Circle No. 313 On Inquiry Card

Ironing Out Security

Though it sounds like something coated with Teflon, Ironware is actually a set of software utilities that Maximum Computer Technologies has devised for software developers to copy-protect their software. According to the company, when the utilities are used, the software's source diskette cannot be copied. Once the software has been installed on one computer, it cannot be reinstalled on another unless it is first removed with one of Ironware's removal utilities. The number of installations can also be limited by the software developer.

Ironware is comprised of three programs: one each for formatting, installation, and removal. Each is designed to be integrated with a developer's installation routines. For SCO UNIX and XENIX, it can be used with the **custom** installation utility. Pricing is determined by the number of masters the developer wants to make with the format program. Five masters cost $995, 10 cost $1,900, 20 cost $3,500, and 50 cost $7,950. **Maximum Computer Technologies, 1355 Terrell Mill Rd., Bldg. 1466, Ste. 100, Marietta, GA 30067; 404-952-5398.**

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Circle 121 on reader service card

SOFTWARE APPLICATIONS

For Anyone Who's Ever Wanted to be a UNIX Lizard

Challenging Crosswind Technologies and Phase II Software for the group scheduling software market is the unusually named Gecko Software's Gecko Meeting (a gecko is a small tropical lizard). Gecko Meeting runs under both SunView and Open Look interfaces, as well as on X terminals attached to Sun hosts. The software was designed to simplify real-time meeting scheduling without the need to contact attendees by phone or e-mail to determine their availability. It can also be used to schedule rooms. The software also features an access control mechanism for user permissions and a text-searching capability for finding specific meetings using keywords. Cost is $75 per user and site licensing is available. **Gecko Software, 261 Hamilton Ave., Ste. 303, Palo Alto, CA 94301; 415-327-8982.**

Circle No. 315 On Inquiry Card

SOFTWARE DEVELOPMENT

Well Sure, I'd Like Another UIMS

Advanced Software Engineering Technologies (ASET) is targeting the already burgeoning user interface management system (UIMS) market with its Agora software. Agora is designed to simplify the creation of user interfaces through a variety of techniques, including application portability across multiple interface toolkits, the ability to integrate newer interface toolkits as they're developed and implement an interface prototype into a final product without having to rewrite it in a target language.

Based on the Seeheim working group project on graphical interfaces developed at Carnegie-Mellon University, the software consists of five parts. It has languages designed for interface specification and to define the interface between Agora and the application, a transaction processing library, an interactive editor for the construction of display, and the appropriate I/O technologies. Available under Motif and X11R4 on Sun SPARCstations, Agora is priced at $10,000. **ASET, 221 Woodhaven Dr., Pittsburgh, PA 15228; 412-343-6237.**

Circle No. 316 On Inquiry Card

I Don't Give a Figraph

Template Graphics Software has enhanced ISML's Exponent Graphics library for 2-D applications, and created Figraph, a charting and graphing toolkit for the creation of 3-D applications. It uses the industry-standard PHIGS graphics format library as its basic architecture. Figraph works with TGS' Figaro+ implementation of PHIGS. Integration with PEX, the PHIGS extension to X, is still under development.

Figraph incorporates a variety of 3-D plotting and charting formats, including scatter and function plots, splines, histograms, frequency polygons, pie charts, and vector and contour plots. Price starts at $3,000, depending on workstation platform. **Liant Software, 3510 Dunhill St., San Diego, CA 92121; 619-457-5359.**

Circle No. 317 On Inquiry Card

STORAGE

When You Wish Upon DSTAR

Jodian Systems & Software's DSTAR (document storage and retrieval) system is designed as a document manager to be used across networks. Users can scan, archive, retrieve, and print documents stored as compressed images on optical disks. The DSTAR system uses a Motif interface and organizes documents in cabinets, drawers, and folders for easy categorization, and users can retrieve documents via SQL queries. Clients can be organized on the network by the system administrator according to view, view/edit, scan, archive, or print permissions.

The software also supports security features for confidential documents. Enhancements under development include support for bar coding, fax, and optical character recognition. Running on SunOS, IBM AIX, SCO, and UHC's System V Release 4, the DSTAR software ranges in price from $495 to $2,995. **Jodian Systems & Software, 22648 Glenn Dr., Ste. 205, Sterling, VA 22170; 703-742-7795.**

Circle No. 318 On Inquiry Card

On GigaGuard

Delta Microsystems has integrated its BudTool backup software with a Sun

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SPARCstation 2, eight-millimeter tape drives, disk drives, and optical drives for a mix-and-match backup and retrieval system called GigaGuard. The system incorporates a jukebox carousel for eight-millimeter tapes, which can hold one or two drives and up to 45 tapes for a total of 225 gigabytes of data. Users can also add a storage tower to the system with up to four hard or optical disks. Fully configured with two five-gigabyte eight-millimeter tape drives and four 1.5-gigabyte disk drives, including the SPARCstation 2, the GigaGuard system costs $110,000. The jukebox is available separately, with BudTool backup software and appropriate drivers, fully configured, for $70,000. **Delta Microsystems, 111 Lindberg, Ste. C., Livermore, CA 94550; 510-449-6881.**

Circle No. 319 On Inquiry Card

Weekend at Bernoulli's

Iomega has devised three new removable and ruggedized disk storage systems for UNIX workstations: one single enclosure with a 90-megabyte disk drive, a double enclosure with two 90-megabyte disk drives, and one subsystem with a 5 1/4-inch 600-megabyte rewritable optical disk drive called LaserSafe. According to the company, access time for the disk drives is 19 milliseconds and they can be used as network file servers for booting by diskless workstations.

The products include SCSI ID selects, termination switches, switchable 110/230-volt power supplies, and dual SCSI-2 connectors so that several can be daisy-chained together. Prices are $1,399 for the single drive, $2,599 for the dual drive, and $4,999 for the LaserSafe system. Iomega's WorkStation Interface kit, for linking the drives to Sun workstations, is $79. **Iomega Corporation, 1821 W. 4000 South, Roy, UT 84067; 800-456-5522 or 801-778-1000.**

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WORKSTATIONS AND SYSTEMS

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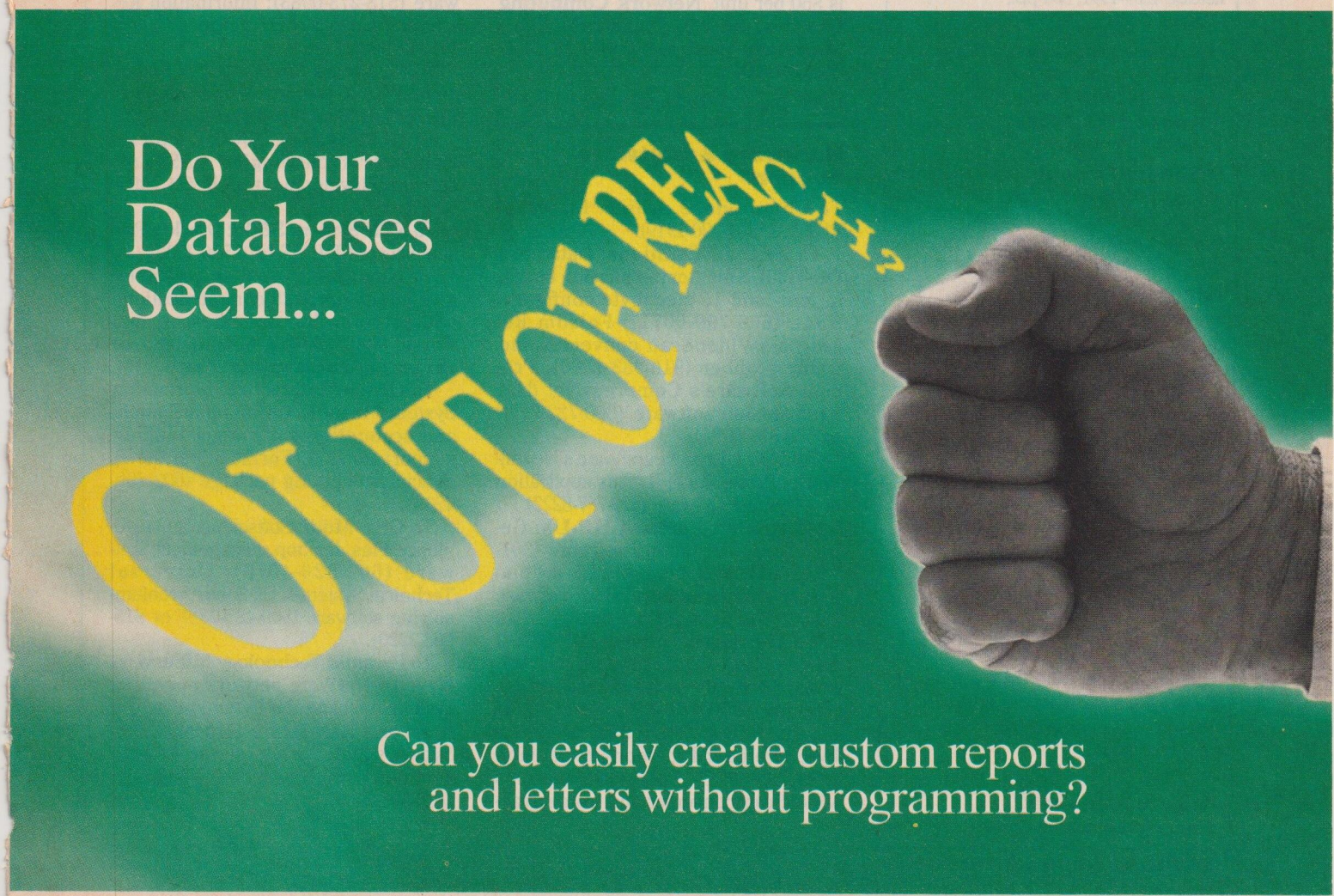
Solflower has developed a SPARCstation 2-compatible workstation that accommodates traditional SBus boards and earlier Sun machines' VMEbus-based boards. The SFVME 400 is available as a complete system, with a 28.5-mips SPARC CPU, or as a desktop enclosure that original equipment manufacturers (OEMs) and system integrators can configure with their choice of CPU and peripherals.

The system is the same footprint, but double the height, of a traditional pizza box, with room for two SBus boards, an industry-standard VME backplane for up to three 6U VMEbus boards, and room for two 3 1/2-inch SCSI disks, one 3 1/2-inch floppy, and one full-height 5 1/4-inch disk, tape, or optical drive. OEM price for a non-configured enclosure is $5,000. A configured system lists for $19,000. **Solflower Com-**



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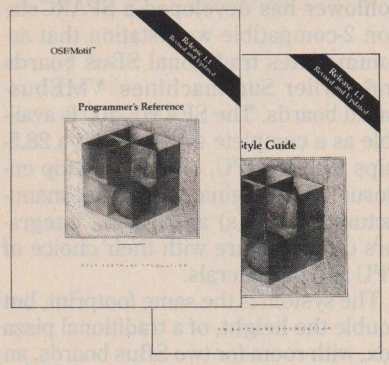

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puter, 2362 Qume Dr., Ste. A., San Jose, CA 95131; 408-456-5055.

Circle No. 321 On Inquiry Card

NCD Takes a RISC

NCD has topped off its X terminal line with a 19-inch, color X terminal sporting a Motorola 88100 RISC processor (Motorola owns 10 percent of NCD). With the resolution of 1280-by-1024, the NCD19c can display 256 colors from a palette of 16.7 million. For desktop publishing applications, it can display two pages of text. In addition to the 20-MHz 88100 processor, the NCD19c includes two custom ASIC chips–one is a graphics processor and the other an interface between the CPU and memory. Like other NCD X terminals, it runs X11R4, supports xdmcp (X display manager control protocol), can access multiple local telnet or local-area transport clients, and can by managed by simple network management protocol. Cost is $6,395, including six megabytes of dynamic RAM (upgradeable to 40 megabytes using 32-bit SIMMs). Software license is $50 per unit. **Network Computing Devices, 350 N. Bernardo Ave., Mountain View, CA 94043; 415-694-0650.**

Circle No. 322 On Inquiry Card

Hardware & Software Support

To **Commodore Amiga**: Empress' RDBMS (301-220-1919).

To **DEC DECstations**: Dataram's DR-3100DS memory expansion board, in four- and 16-megabyte configurations (609-799-0071); Folsom Research's VideoScan converter and frame grabber (916-983-1500); Process Software's CompressNet data compression software (800-722-7770 or 508-879-6994).

To **DEC Ultrix**: NeuralWare's NeuralWorks Professional II/Plus application development software (412-787-8222).

To **Hewlett-Packard HP-UX**: Gejac's Arsap accounting software (301-725-2500); Process Software's CompressNet data compression software (800-722-7770 or 508-879-6994).

To **Hewlett-Packard HP 9000 Series 700**: Central Data's scsi Terminal Server for serial and parallel expansion (800-482-0315 or 217-359-8010); Dataram's DR-9700 16-megabyte two-board memory expansion (609-799-0071); Folsom Research's VideoScan converter and frame grabber (916-983-1500); Stardent's Advanced Visualization System (AVS) graphics environment (508-287-0100).

To **Hewlett-Packard HP 9000 Series 800**: Lawson Associates' Lawson Accounting System (612-379-0258); Saber Software's Saber-C programming environment (617-498-3000).

To **IBM AIX**: Lawson Associates' financial, human resources, and distribution application software (612-379-2633); Process Software's CompressNet data compression software (800-722-7770 or 508-879-6994).

To **IBM RS/6000**: Alsys's Ada development environment (617-270-0030); Photron's Video/Genesis/24, a 24-bit true-color frame buffer adapter in MicroChannel format (201-429-9337); The Portland Group's compilers and software development tools (503-682-2806); Saber Software's Saber-C programming environment (617-498-3000).

To **Modcomp's Real/Star real-time systems**: Informix's RDBMS and 4GL programming tools (415-926-6300).

To **Motorola 88000**: Camber-Roth's Caucus groupware conferencing software (518-273-0983); Information Resources' Cosort sort/merge software (518-851-2815).

To **Mt Xinu's Mach 386**: SCSI and color VGA X Window server support (415-644-0146 or `info@mtxinu.com`).

To **NCR System 3000**: Synthesis Computer Technologies' CASE/AP software development tools (213-494-4069).

To **NCR System 3600**: Oracle's Parallel Server RDBMS (415-506-2200).

To **Next**: Morning Star Technologies' SnapLink X.25 communications subsystem to link to wide-area networks. (800-558-7827, 614-451-1883, or `marketing@MorningStar.Com`).

To **Oracle**: Interactive Information Systems' manufacturing, distribution, and accounting software, including support for SQL*Forms 3.0 in the financial accounting package (602-790-4214).

To **OSF Motif**: Softscience's Convenience Plus desktop management software (602-326-4679); Universal Technical Systems' TK Solver problem-solving software (800-435-7887 or 815-963-2220).

To **Pyramid Technology MIServers**: Novell's NetWare network operating system, enabling the Pyramid machine to act as a LAN server (415-965-7200); Sybase's SQL Server release 4.8 with symmetric multiprocessing support (415-596-3500).

To **SCO UNIX**: Applix's Asterix integrated office software (508-870-0300 or `uunet!applix!asterixinfo`).

To **Sequent Symmetry 2000**: Sybase's SQL Server release 4.8 with symmetric multiprocessing support (415-596-3500).

To **Sony News 3250 RISC laptop**: RasterOps' color display adapter (408-562-4065).

To **SPARC processors**: USL's Tuxedo Transaction Processing System source code of online transaction processing (OLTP) application development (800-828-UNIX).

To **Sun**: Cipher's TapeXpress 3480-compatible 1/2-inch cartridge tape drive (619-693-7180); IntelligenceWare's IXL database querying software (213-216-6177); Morning Star Technologies' PPP (point-to-point protocol) for TCP/IP communications between networks (800-558-7827, 614-451-1883, or `marketing@MorningStar.Com`); OpenConnect Systems' OpenConnect Server II IBM gateway software (214-490-4090); Process Software's CompressNet data compression software (800-722-7770 or 508-879-6994).

To **Sun SPARCstation 2**: Dataram's DR-475 32-megabyte memory expansion board (609-799-0071).

Hardware Upgrades

IBM offers three new graphics subsystems and a disk storage subsystem for the RS/6000 (800-426-3333).

Novell adds NFS (network file system) and OSI (open system interconnection) support to version 3.11 of its LANalyzer network analyzer (408-434-2300).

Solbourne offers a multichannel accelerator board to improve I/O on its multiprocessing servers (303-678-4711).

Sun has increased memory capacity on the SPARCstation 2 and SPARCserver, offering 32 megabytes of main memory and 424 megabytes of disk capacity (415-960-1300).

Tripp Lite offers PowerMon automatic shutdown software for UNIX to its UPS (uninterruptible power supply) systems (312-329-1777).

Software Upgrades

Ashton-Tate adds support for OpenWindows in its dBase IV for Sun software (213-329-8000).

Atherton Technology adds one-touch launching of programmatic shell scripts with "accelerator buttons," the ability to integrate organizational policies and procedures into a development environment, and easier import and export of objects in version 2.7 of its Software BackPlane computer aided software engineering software (408-734-9822).

Benebeck Group adds multinational capabilities to its Progress-based Benebeck GL accounting software (203-268-7201).

Crosswind Technologies adds enterprise-wide time management capabilities to release 1.2 of its Synchronize calendar tool to support scheduling across multiple time zones, along with user customization and personal database capabilities (408-335-4988).

Elsid Software Systems adds real-

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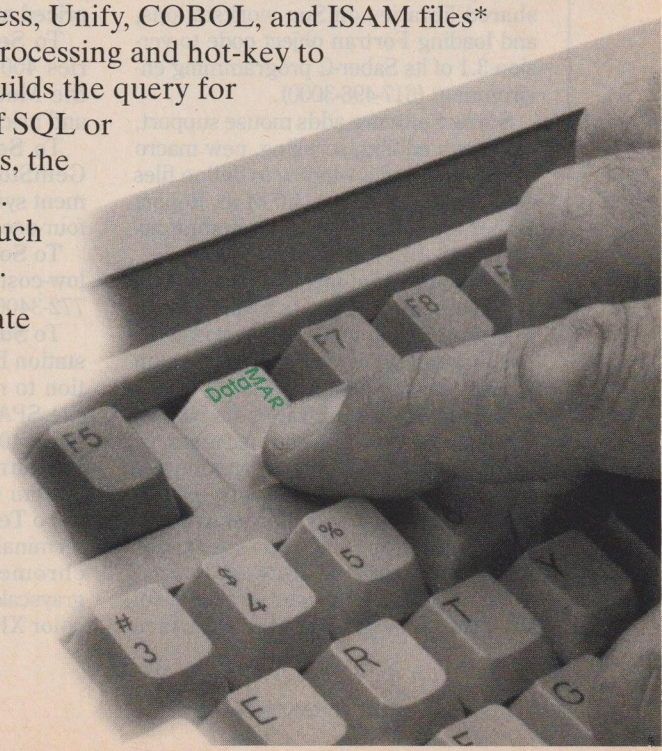

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CIRCLE NO. 126 ON INQUIRY CARD

time capabilities to its Ripcam version 2.22 spreadsheet by integrating LynxOS (613-228-9468).

Freedom of Press adds support for Kodak and Canon printers and CalComp plotters in version 3.0.4 of its Sun-based Professional PostScript language interpreter (508-667-8585).

Information Resources has given version 2.5 of its Cosort sort/merge software "eight-bit clean" character handling and the ability to recognize 34 MicroFocus and Ryan McFarland's Cobol data types (518-851-2815).

KL Group adds stacking bar charts, encapsulated PostScript output, C++ bindings, and site licensing to version 2 of its XRT/graph for XView developer's toolkit (416-594-1026).

Ontos (formerly Ontologic) adds flexible transaction and concurrency control models, an integrated object SQL, and extensible storage management to release 2.1 of its Ontos object database management system (617-272-7110).

ParcPlace Systems integrates Objectworks\C++ release 2.4 with external UNIX development tools–editors like `emacs` and `vi`, utilities like `make` and `imake`, and tools such as `yacc++` and `lex++`–and adds the capability for software development engineers to load and browse co-workers' code without interruption (415-691-6700).

PsyBorne adds a menu interface as well as new formatting and editing commands to version 2.0 of its Companion for WordPerfect 5.0 for UNIX (416-536-6610).

Saber Software adds support for embedded SQL preprocessors, dynamic shared libraries on Sun workstations, and loading Fortran object code to version 3.1 of its Saber-C programming environment (617-498-3000).

Snow Software adds mouse support, on-screen editing, scrolling, new macro definitions, and a window to define files and fields, in version 4.0 of its Report Writer for database and accounting applications (813-784-8899).

Software One upgrades version 7.0 of its Usermenu software to allow users to change menu colors and choose between a full-screen or scrolling menu format (614-451-1800).

Sound Ideas upgrades its Mister Mailman version 2.0 electronic message software with the ability to announce a telephone call or the arrival of e-mail on a user's terminal or to access another user's mail for telephone messages (800-633-5250 or 201-728-2428).

Visual Edge enhances version 2.0 of its UIM/X graphical user interface builder with new color and pixel map editors; a new widget tree editor; user-defined widget palettes; custom widget capabilities; a new editor for working with multiple widgets simultaneously; and integrated support for 16-bit internationalization (514-332-6430).

Product Line Extensions

To **Advanced Logic Research**: a Powerpro Array server using two 50-Mhz Intel 486DX processors capable of running SCO MPX and ranging in price from $17,999 to $23,999, based on disk storage capacity (714-581-6770).

To **Chase Research**: a low-cost, eight-port TCP/IP terminal server priced at $1,795 (615-872-0770).

To **Deltec**: the 90S Series UPS, measuring 45 by 24 by 32 inches, with KVA (kilovolt-ampere) ratings from eight to 18 (619-291-4211).

To **Legato Systems**: a single file-server version of Legato NetWorker backup and recovery software called NetWorker Junior, priced at $750 (415-329-7880).

To **Locus Computing**: PC-Interface software for linking desktops to UNIX systems is now available for DOS machines using Windows 3.0 at $235 per user and Apple Macintoshes at $720 for a two-user license (213-670-6500).

To **QMS**: two PostScript-compatible desktop printers with 600-by-600 dots per inch resolution, priced at $5,495 for single-tray or $6,495 for dual-tray (205-633-4300).

To **Retix**: the 4760 brouter for bridging local networks and routing WANs, priced at $4,250 (213-399-2200).

To **Sequoia**: the fault-tolerant Series 400 for OLTP applications using the Motorola 68040 microprocessor and priced at $279,000 (508-480-0800).

To **Servio**: a Kanji version of its GemStone object database management system, priced from $20,000 for a four-user environment (415-748-6200).

To **Solbourne**: the 25.5-mips S4000 low-cost server, priced at $6,995 (303-772-3400).

To **Sun Microsystems**: the SPARCstation ELC ($4,995) diskless workstation to replace the SLC ($4,995); and the SPARCstation IPX ($11,995), using a 40-MHz processor and integrating Sun's GX graphics processing system (415-960-1300).

To **Tektronix**: three new low-end X terminals, including the 15-inch monochrome XP11 ($1,800), the 15-inch grayscale XP13 ($2,500), and the 14-inch color XP15 ($3,000). ■

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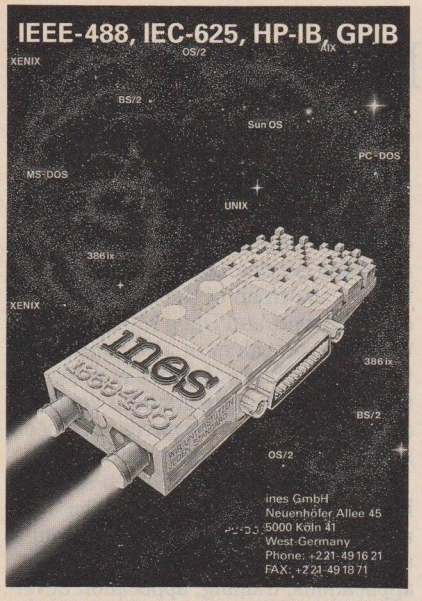

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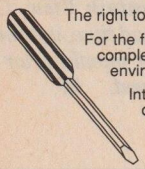

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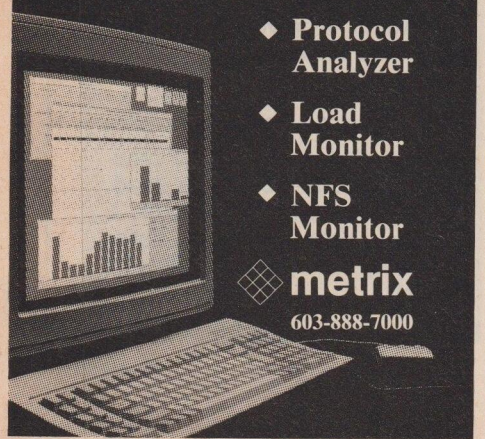

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SHOWS & CONFERENCES

Open Systems '91: Nov. 6-8
Billed as "Europe's largest event dedicated to open systems," UniForum UK's Open Systems '91 exhibition and conference is designed as an opportunity for users to learn how the future of open computing and standards fits into their present information technology investment. Focusing on interoperability, conference organizers hope Open Systems '91 will provide an opportunity for users and suppliers to work together to create computer systems that meet the present and future needs of users.

More than 130 exhibitors, including IBM, Digital Equipment Corp., ICL, Informix, NCR Corp., Open Software Foundation, Oracle, Sequent, Sun Microsystems, and 3Com will take part in the exhibit portion of the event.

Open Systems '91 will be held at Olympia 2 in London, England. Contact Jackie Windward of Reed Exhibitions at +44-81-948-9915.

Autofact '91: Nov. 10-14
Sponsored by the Society of Manufacturing Engineers (SME) and the Computer Automated Systems Association of SME, this conference and exhibition is billed by its organizers as "North America's largest exposition and conference for automated and computer integrated manufacturing." The event has been designated as part of the U.S. Department of Commerce's Foreign Buyer Program.

Conference seminars, tutorials, forums, and technical sessions are divided among seven interest tracks: management, product design, product and process engineering, networking, databases and data integration, and systems integration.

Autofact '91 is expected to draw 25,000 attendees from the aerospace, automotive, electronic, and process industries in the United States, Europe, and the Pacific Rim. The event will be held at McCormick Place East, Chicago, Ill. Contact conference management at 800-733-4763 or 313-271-1500.

UNIX & Open Systems '91:
Nov. 12-13
The conference's theme of "Towards an Open Systems Reality" is meant to reflect the change of focus from vendor to user in the information technology industry. Conference moderators will be David Flack, editor-in-chief of *UNIXWORLD*, and Dr. John Spackman, director of the European Telecommunications Information Service. Speakers include Rob Briggs, chairman of the Computer Users of Europe, and Doug Michels, executive vice president of The Santa Cruz Operation. The conference is designed to appeal more to users than vendors, and the majority of speakers have been selected from user organizations.

Session topics include open systems integration strategies, multivendor environment management, moving from a single vendor system to open systems, applications, training, application development, buying open systems, managing suppliers, and choosing vendors.

The conference is geared toward senior information managers considering open systems; account managers wanting to learn more about user issues and concerns; and consultants, analysts, and others interested in gaining greater understanding of open systems strategies.

The conference will be held at the Hilton International, Brussels, Belgium. Contact Datapro International, +44-628-773628.

Xtra '91: Nov. 13-15
Xtra '91, X/Open's World Congress, is structured as a forum for discussion of user priorities in open systems. The event will include plenary sessions as well as technology update and requirement development workshops on open systems topics. Sessions are designed to brief users on progress in technology, standardization, and products, as well as discuss the nature and extent of user demands.

Scheduled keynote speakers are Paul Strassman, director of information for the U.S. Department of Defense, and A. Frederick Fath, director of integration technologies for Boeing Computer Services. Activities are directed at users, consultants, system integrators, and others dealing with technology, business planning, and government standards, in companies producing hardware, components, and software.

Xtra '91 will be held at the Hyatt Regency in Reston, Va. Contact the Xtra Congress Hotline at 416-594-2035.

PC Expo: Nov. 19-21
The sixth annual PC Expo in Chicago, Ill. is expected to attract an audience of 25,000 management information directors, trade resellers, original equipment manufacturers, and consultants, as well as more than 225 exhibitors.

Workshop topics of interest to UNIX professionals include: object-oriented environments, data security, computer-aided software engineering, network operating systems, client-server architectures, wireless networks, interoperability, operating system environments, SQL front ends, and portable computing.

PC Expo will be held at McCormick Place North, Chicago, Ill. Contact Bruno Blenheim Inc. at 201-569-8542 or 800-444-3976.

Please submit press releases and information regarding upcoming conferences and trade shows to Kim Austin at UNIXWORLD, *444 Castro Street, Mountain View, CA 94041. Due to editorial lead time, information must be received four months prior to the month of the actual event.* ■

NEXT MONTH IN UNIXWORLD

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